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## ***SUPPORTING INFORMATION***

***Title:*** Monitoring Fluorinated Dendrimer-Based Self-Assembled Drug-Delivery Systems with $^{19}F$ Magnetic Resonance

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# Table of contents



## 1. General information

$^{1}$H, $^{19}$F and $^{13}$C NMR spectra were recorded on a Bruker 400 MHz. Chemical shifts are in ppm and coupling constants (*J*) are in Hertz (Hz). $^{1}$H NMR spectra were referenced to tetramethylsilane (d, 0.00 ppm) using $CDCl_3$ as solvent. $^{13}$C NMR spectra were referenced to solvent carbons (77.16 ppm for $CDCl_3$). $^{19}$F NMR spectra were referenced to 2% perfluorobenzene (s, -164.90 ppm) in $CDCl_3$ or 2% sodium trifluomethanesulfonate (s, -79.61 ppm) in $D_2O$. The splitting patterns for $^{1}$H NMR spectra are denoted as follows: s (singlet), d (doublet), q (quartet), m (multiplet). ESI mass was used for compounds below 3,000 Da. MALDI-TOF mass spectra were recorded on a MALDI-TOF/TOF 5800 (AB SCIEX) spectrometer using the reflection mode for positive ions with α-cyano-4-hydroxylcinnamic acid as matrix.

$^{19}$F MRI experiments were performed on a 9.4 T microimaging system with a 10 mm inner diameter $^{19}$F coil (376.4 MHz) for both radiofrequency transmission and reception. The MSME (Multi Slice Multi Echo) pulse sequence was employed for all MRI acquisitions with single average. FOV = 30 x 30 mm$^2$, SI = 40.0 mm TR = 3000 ms and TE = 0.5 ms were used. The data collection time was 192 s. $^{19}$F NMR relaxation experiments were carried out on a 376.4 MHz spectrometer at a $^{19}$F concentration of 0.1 M.

Unless otherwise indicated, all reagents were obtained from commercial supplier and used without prior purification. DMF, $Et_3N$, DCM and THF were dried and freshly distilled prior to use. Flash chromatography was performed on silica gel (200-300 mesh) with either EtOAc/petroleum ether (PE, 60-90 $^{o}$C) or MeOH/dichloromethane (DCM) as eluents.

## 2. Solvent and temperature-dependent $^{19}$F NMR of 1b and 2b

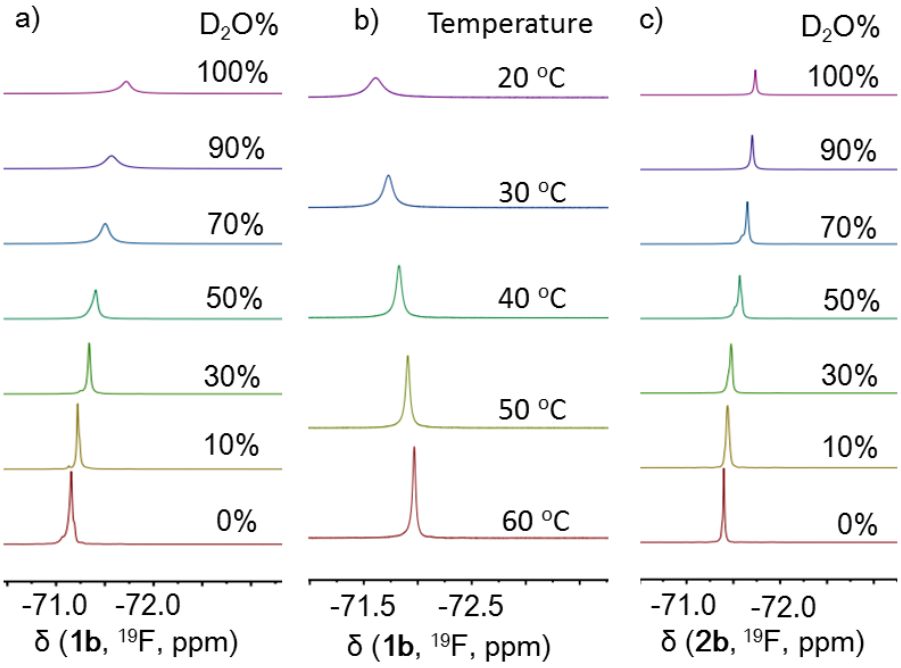



**Figure S1.** Solvent (17.36 mM, 25 °C) and temperature-dependent (8.68 mM, in $D_2O$) $^{19}$F NMR of **1b** (a,b) and **2b** (c).

## 3. CMC of 2b plot with $^{19}$F NMR

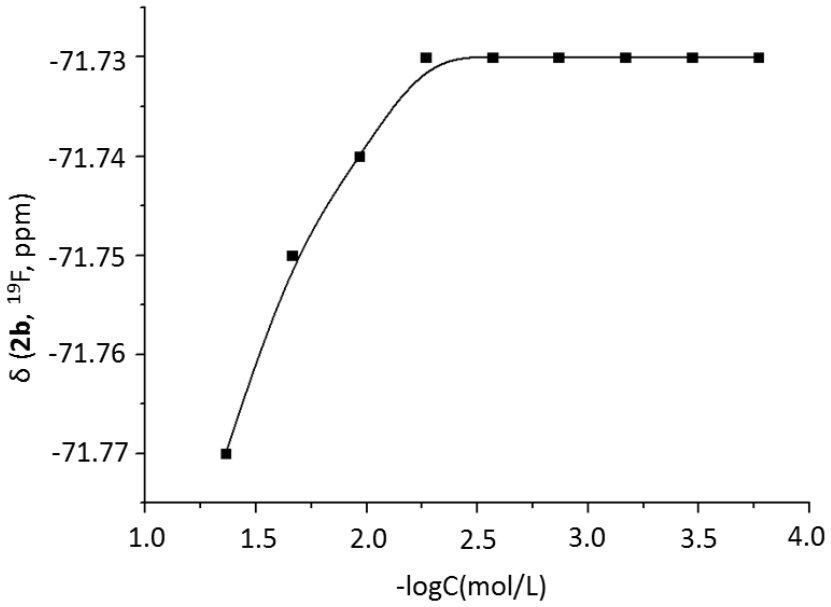


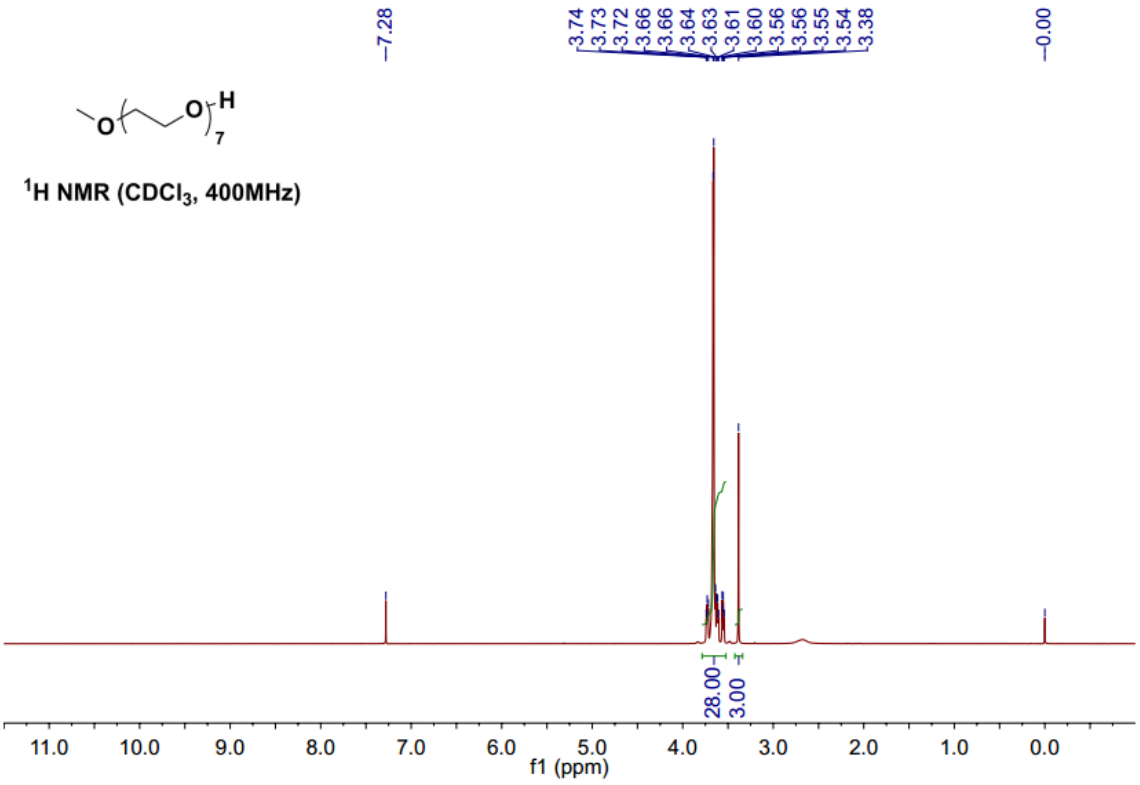

**Figure S2.** Concentration-dependent (25 °C, in $D_2O$) $^{19}$F NMR of **2b**, plot of –logC versus $^{19}$F NMR chemical shift. $^{19}$F NMR CMC 7.35 mM.

## 4. The image of the dendrimer, co-assembly of dendrimer and drug

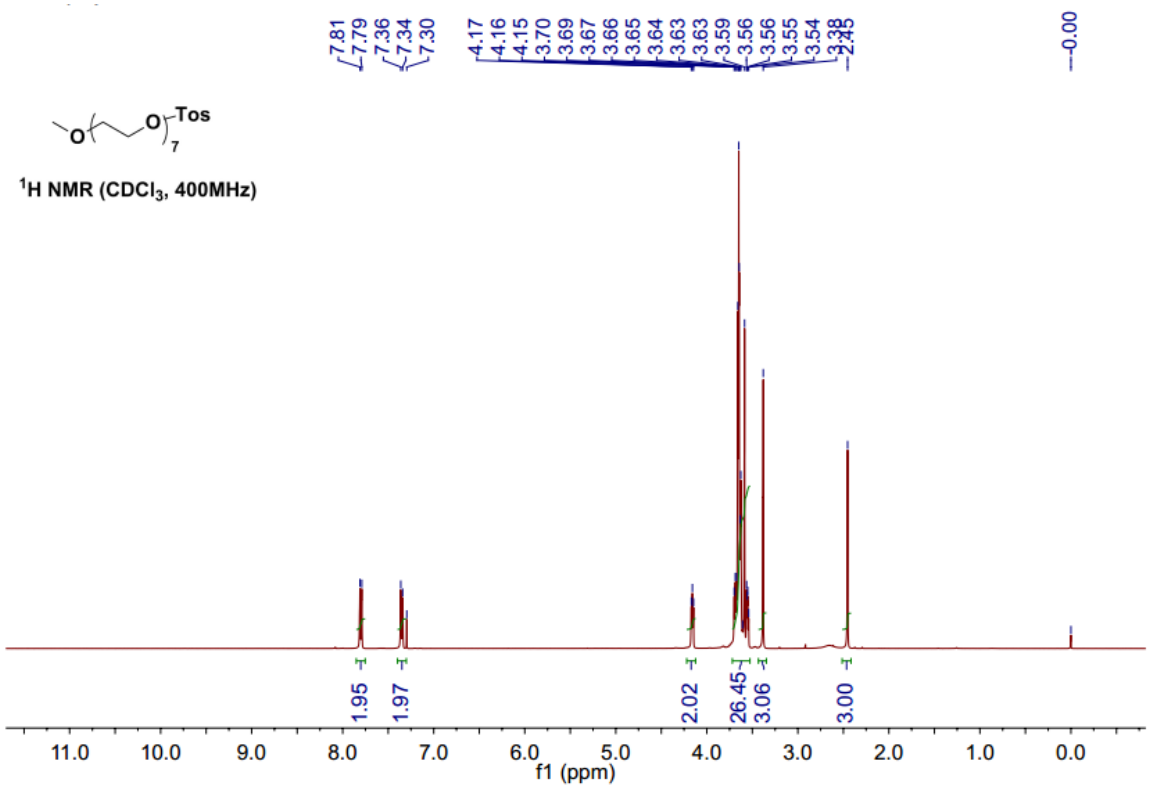

**Figure S3.** Images of the dendrimer **1b** and its drug co-assembly. From left to right: **1b**, **1b**+**H**, **1b**+**G**, **1b**+**F**, **1b**+**E**, **1b**+**L**, **1b**+**K**.

## 5. Copies of $^{1}$H NMR, $^{13}$C NMR, $^{19}$F NMR, MS and HPLC spectra of compounds

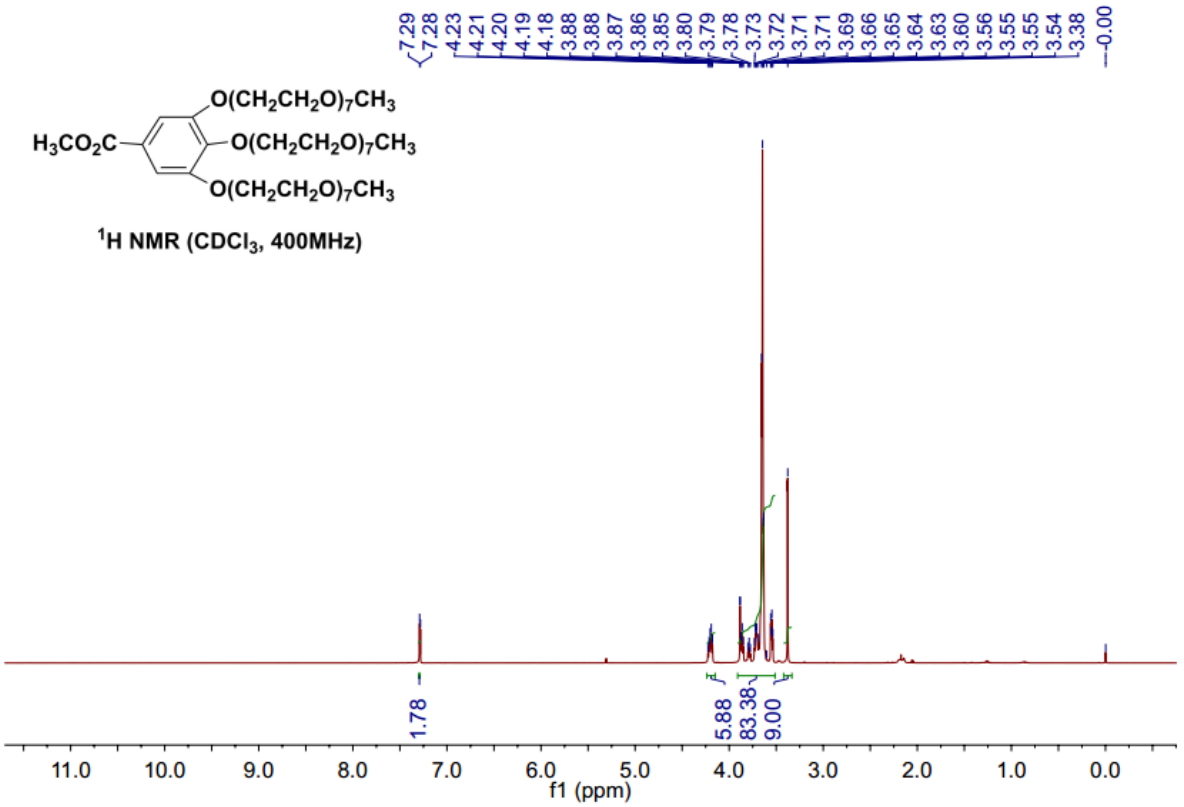
Compound **4**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



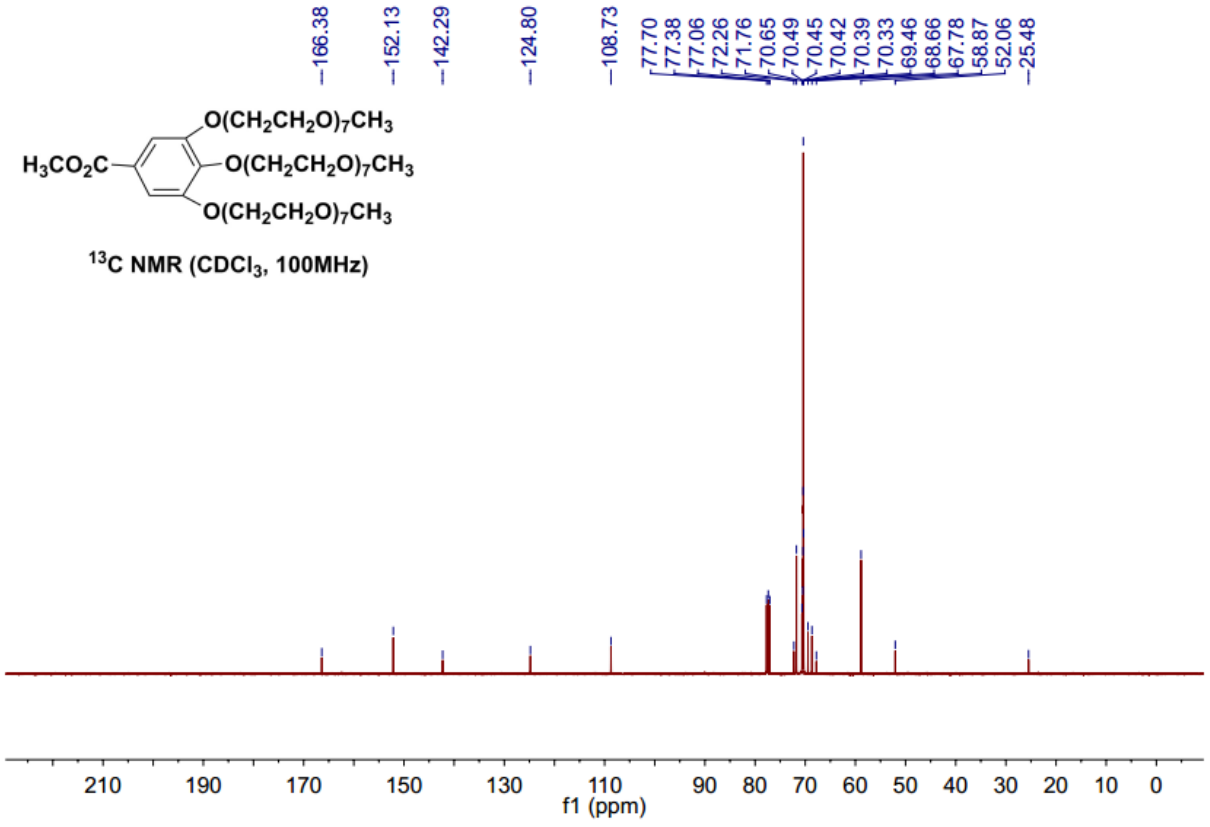

Compound **5**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



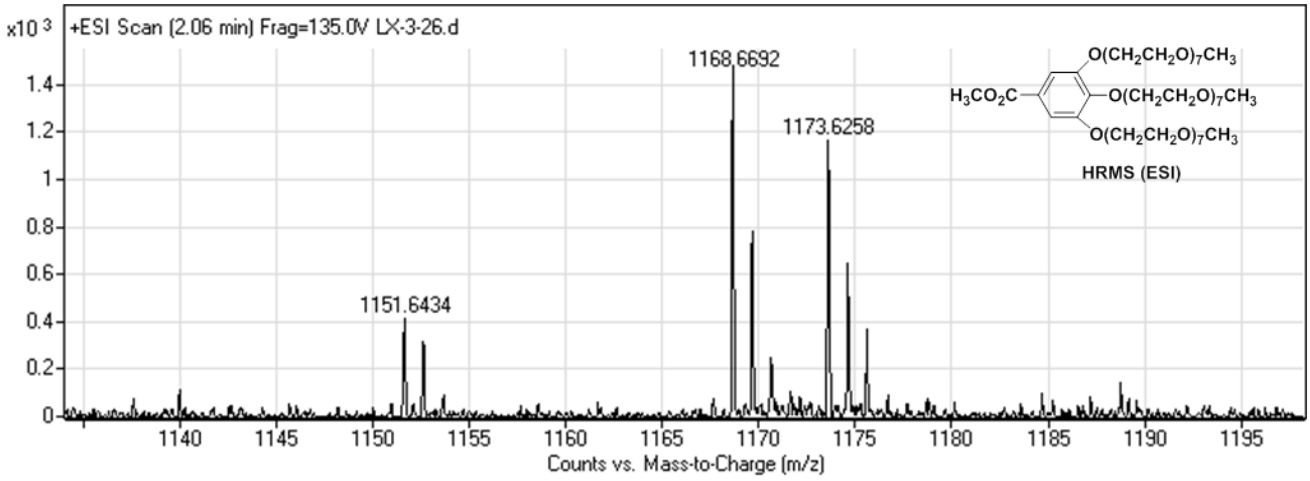
Compound **6**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



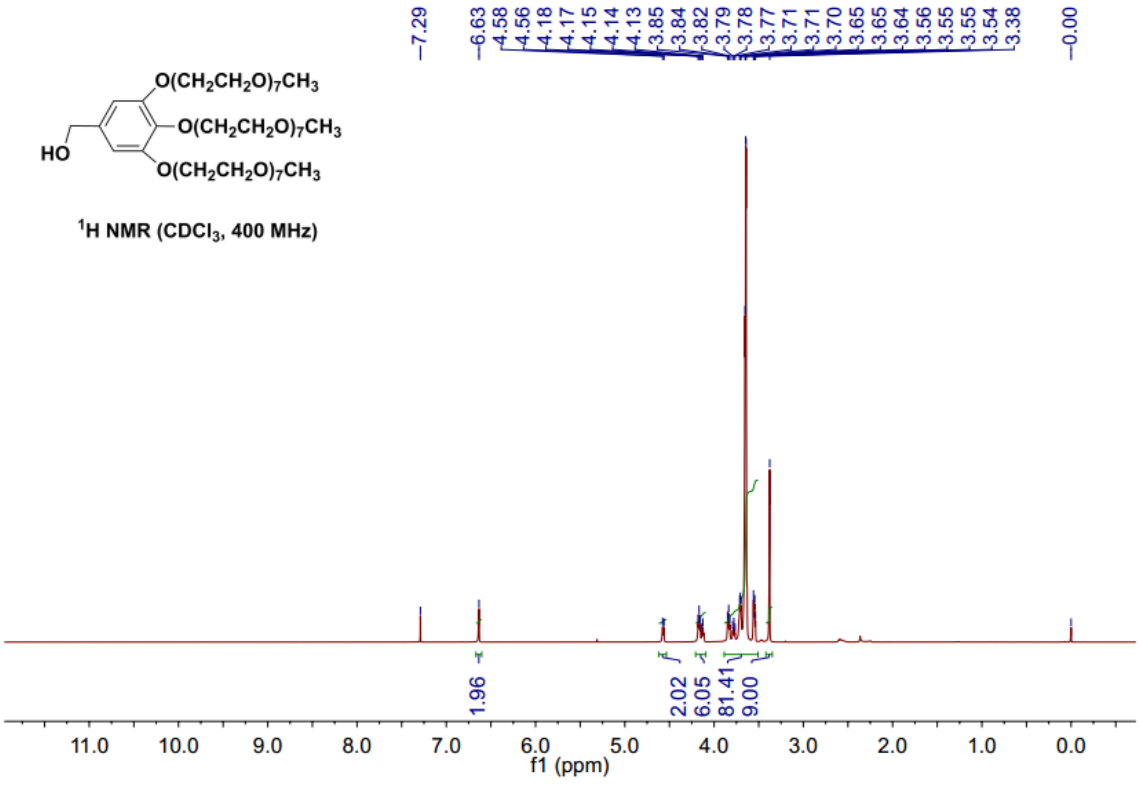

Compound **6**, $^{13}$C NMR ($CDCl_3$, 100 MHz)



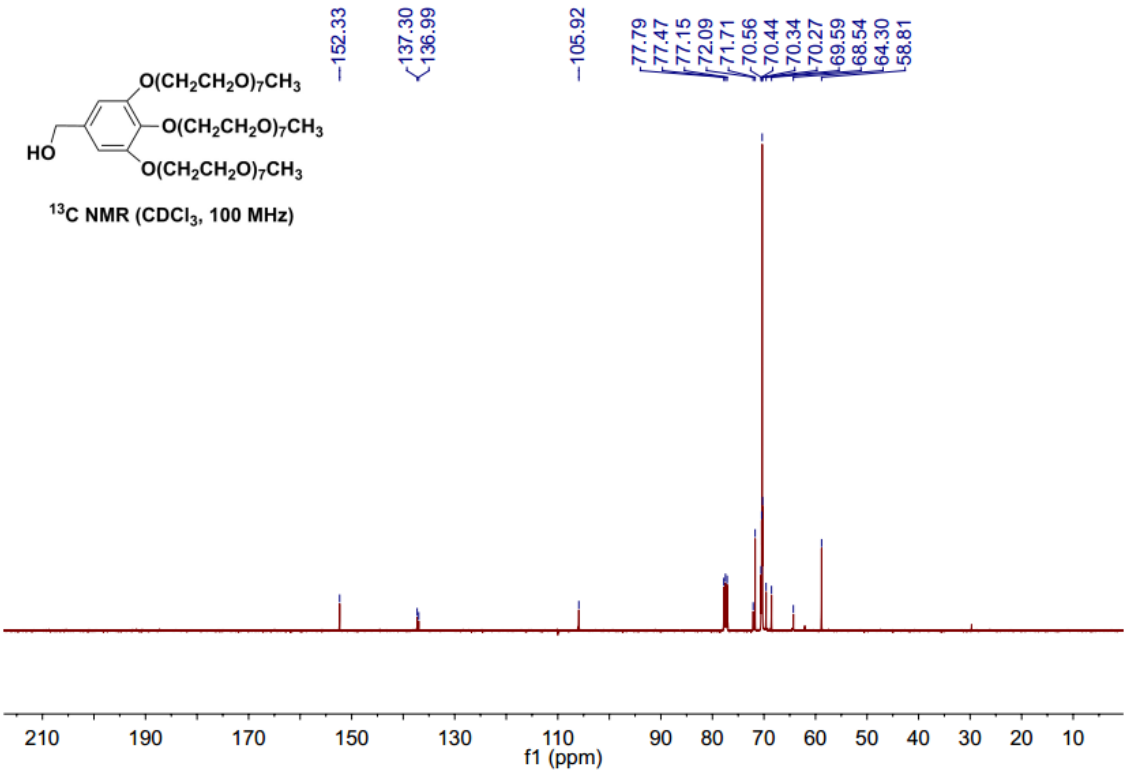
Compound **6**, HRMS (ESI)



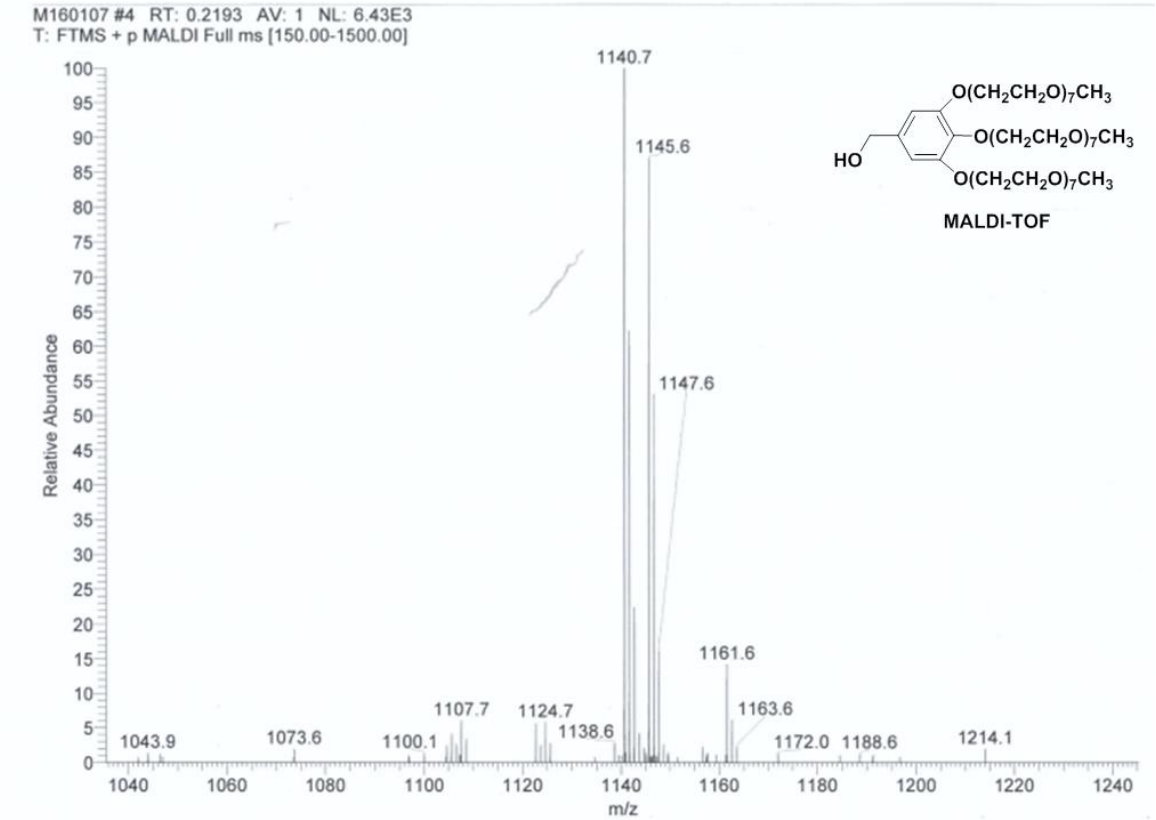

Compound **7**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



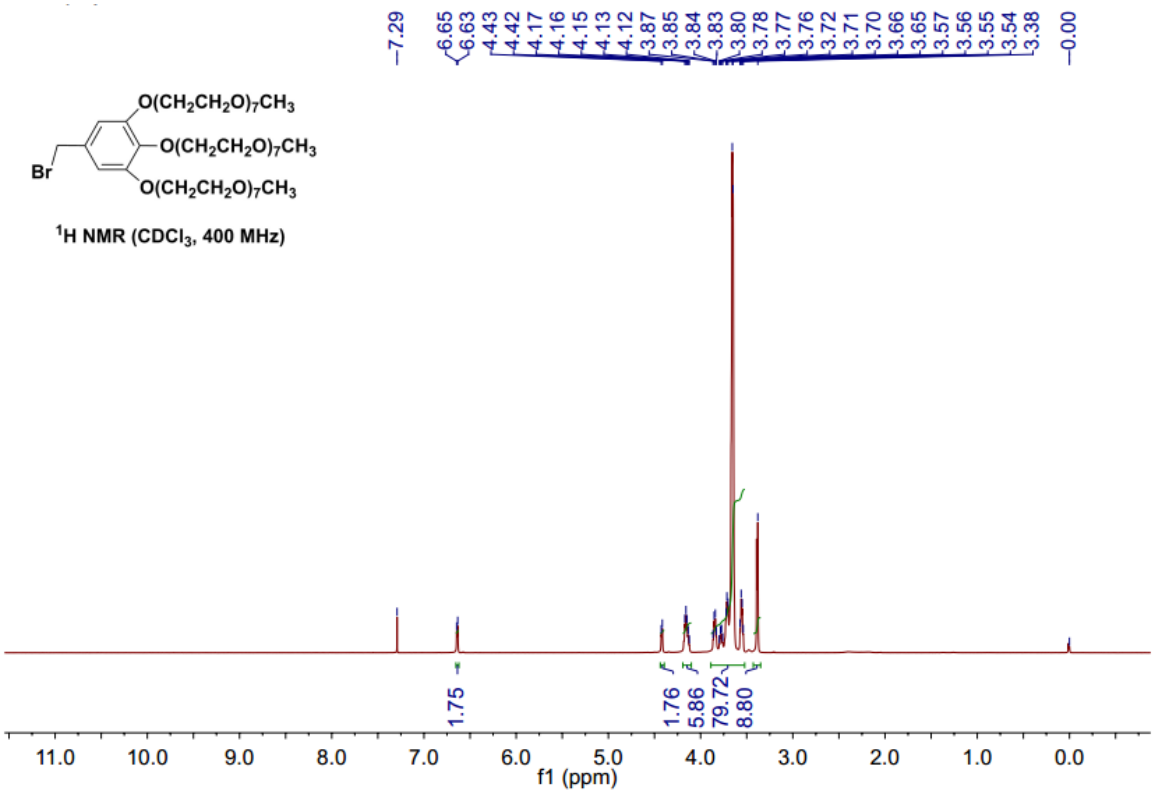
Compound **7**, $^{13}C$ NMR ($CDCl_3$, 100 MHz)



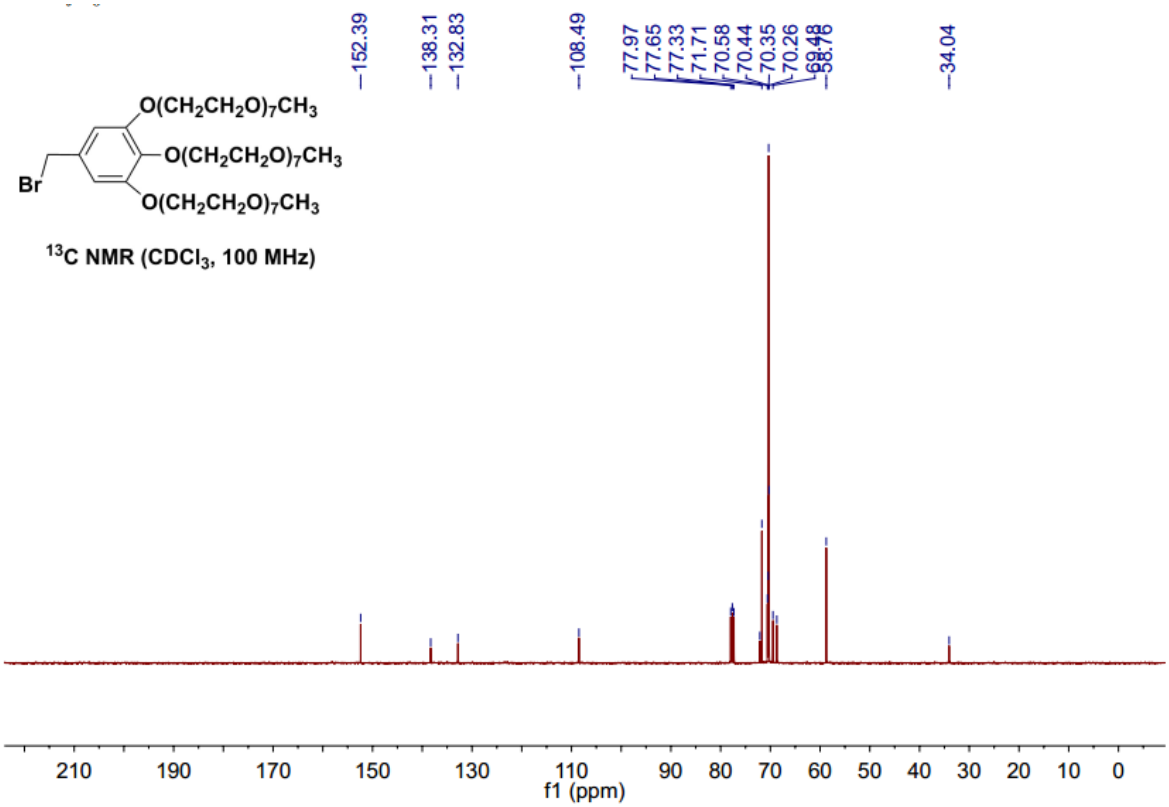

Compound **7**, MALDI-TOF



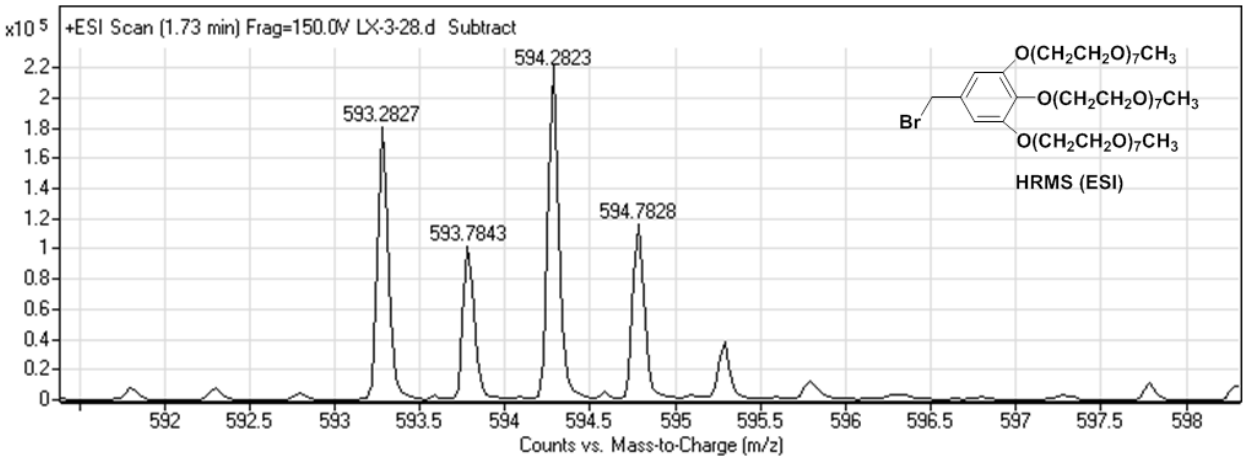
Compound **8**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



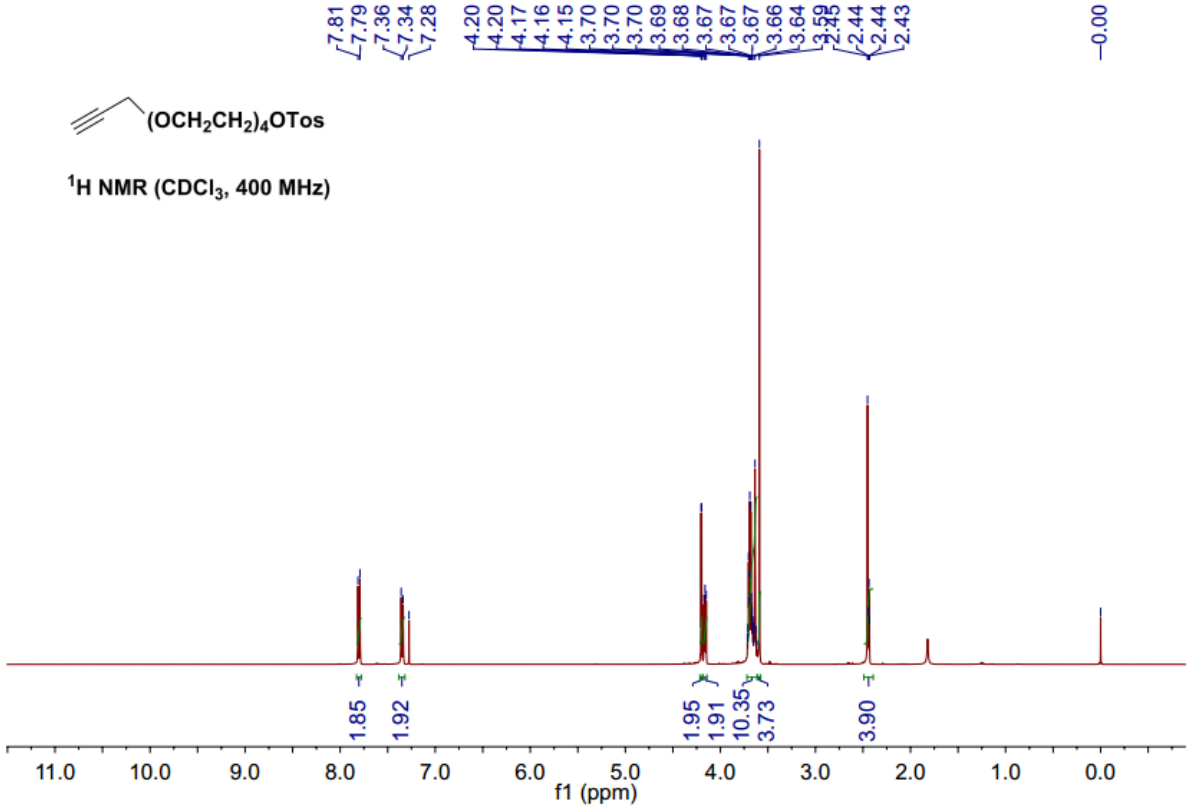

Compound **8**, $^{13}$C NMR ($CDCl_3$, 100 MHz)



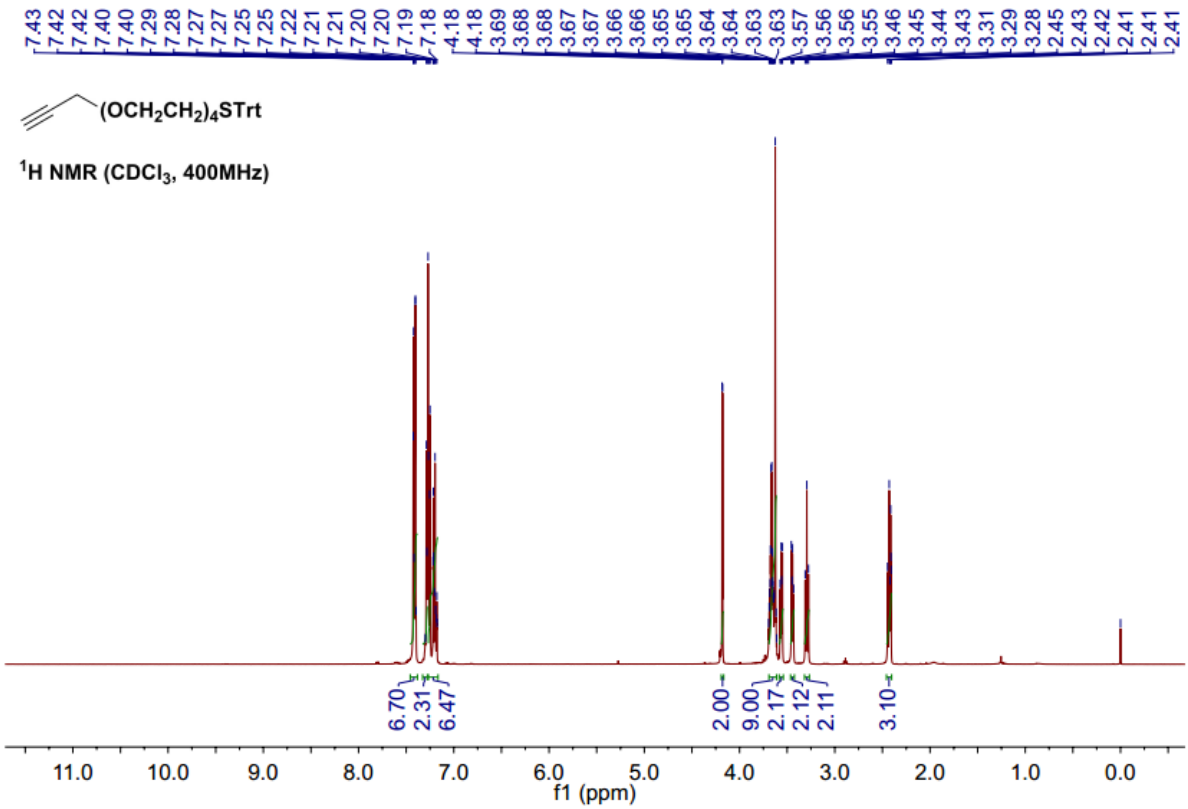
Compound **8**, HRMS (ESI)



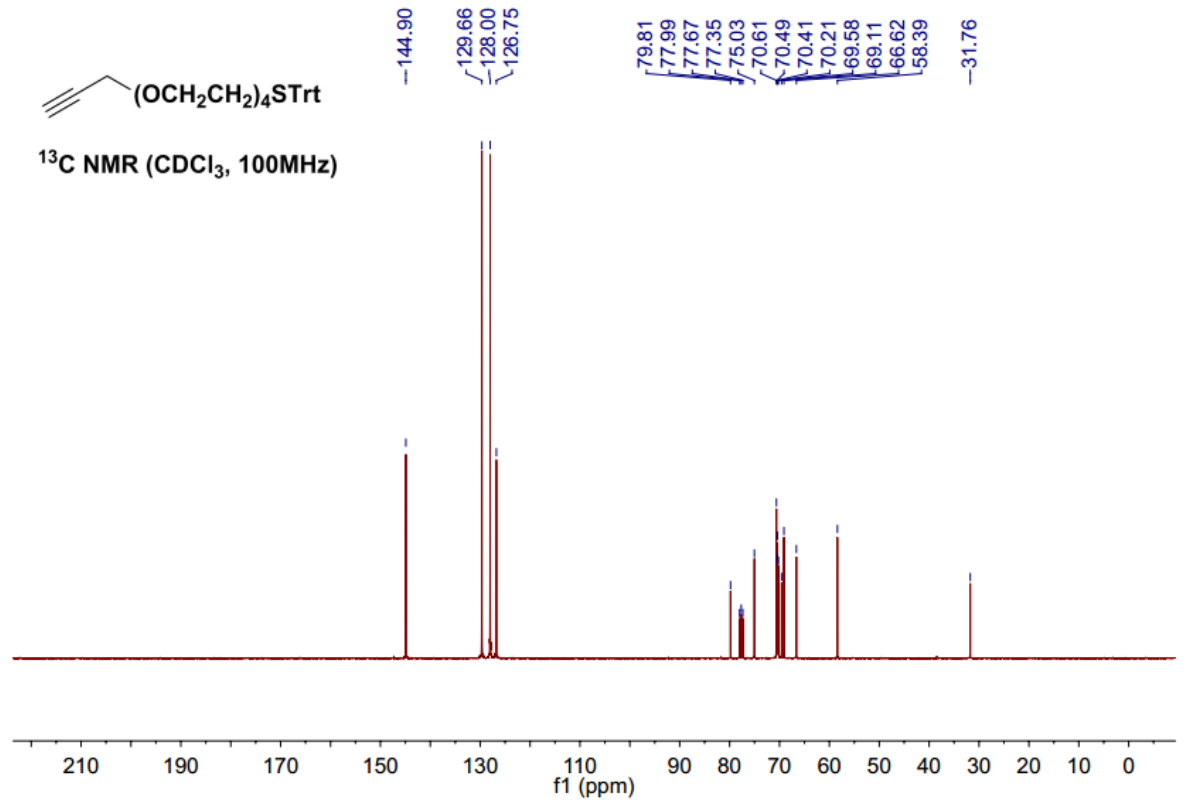

Compound **10**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



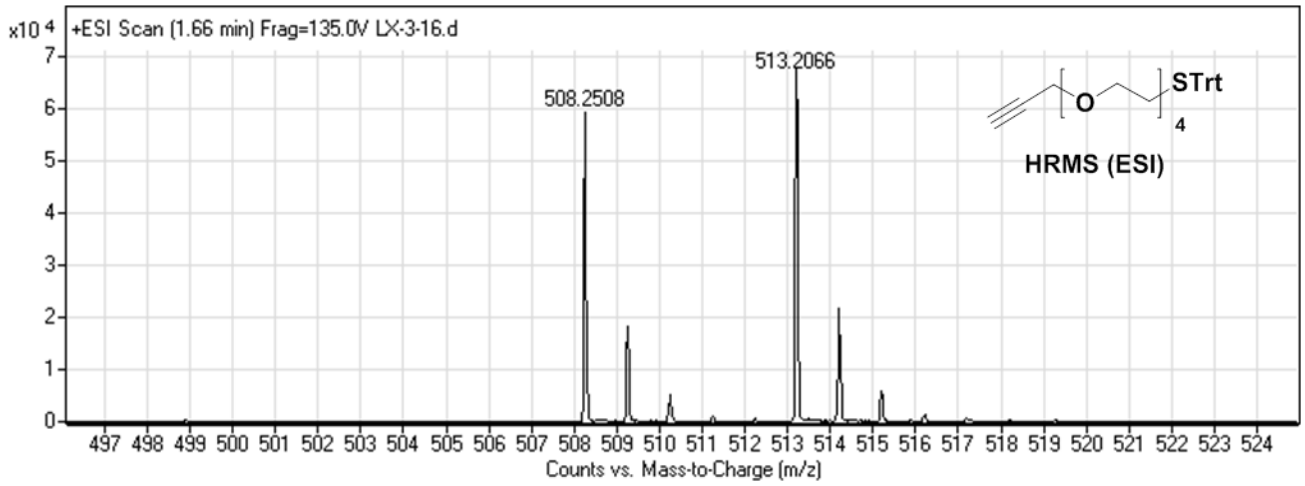
Compound **11**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



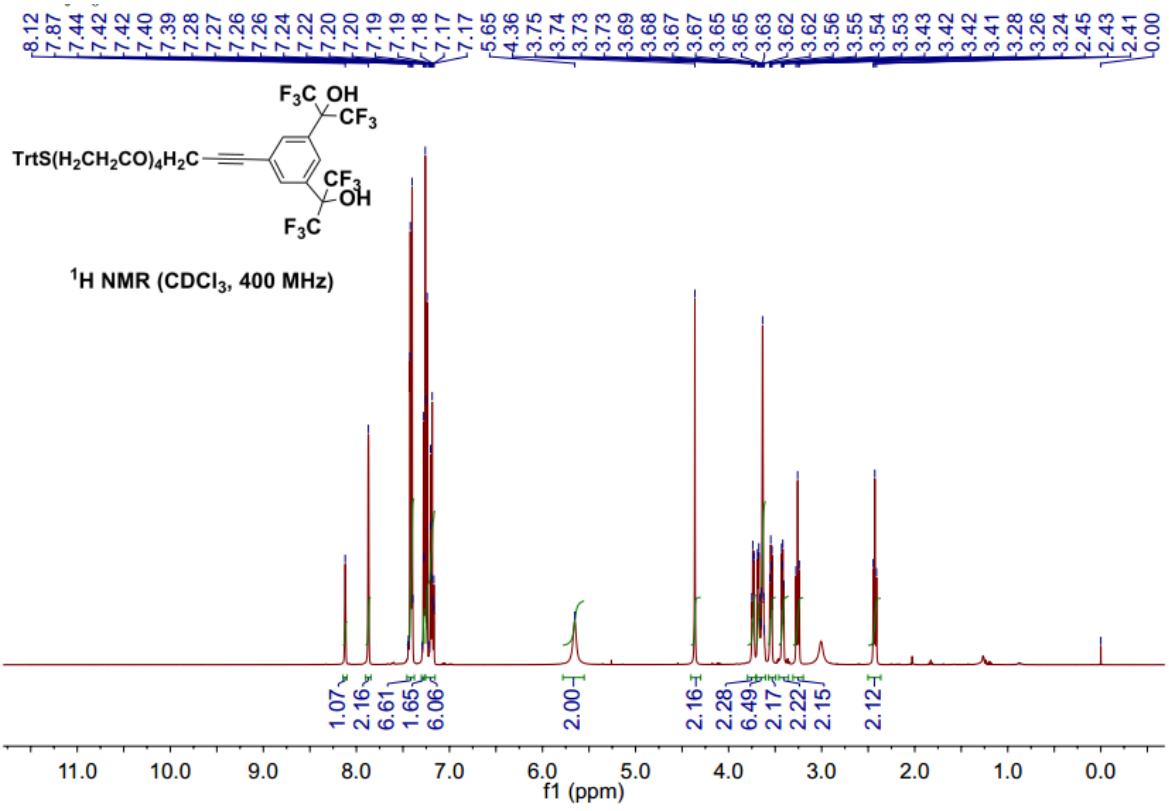

Compound **11**, $^{13}$C NMR ($CDCl_3$, 100 MHz)



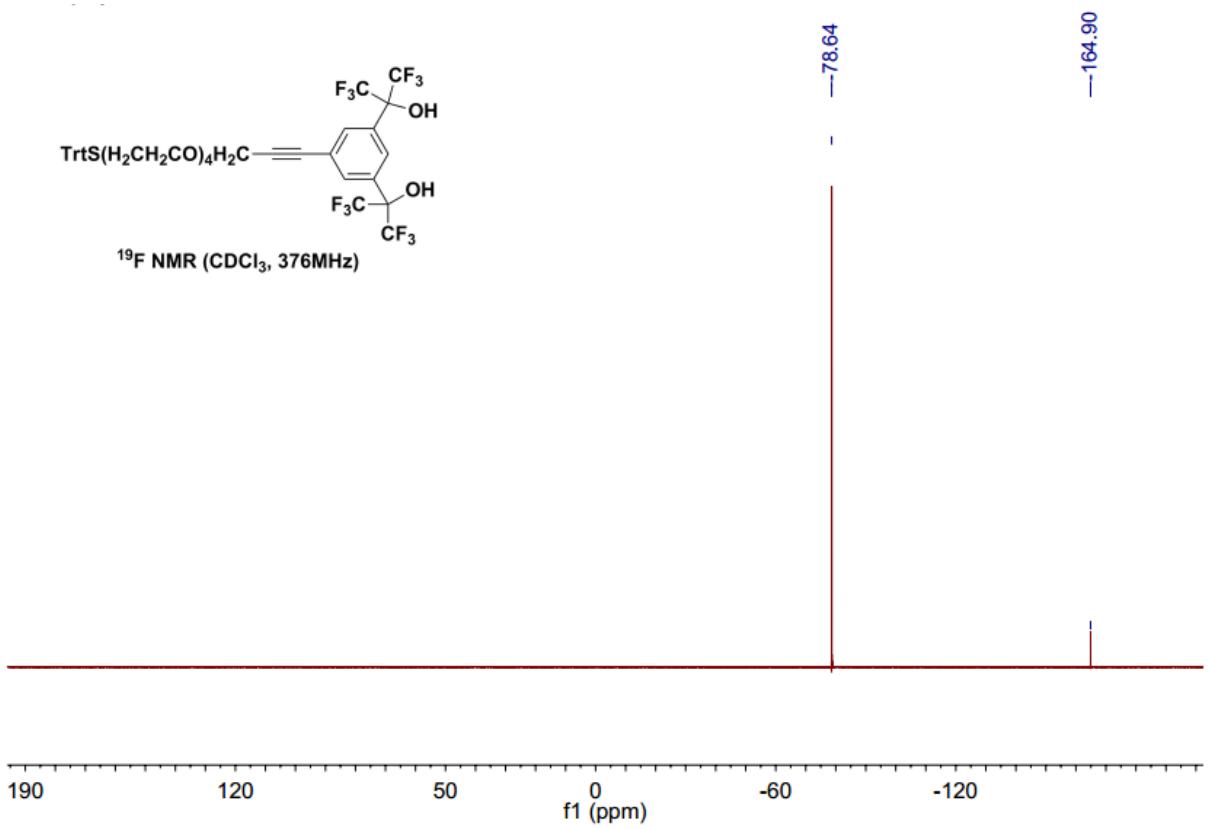
Compound **11**, HRMS (ESI)



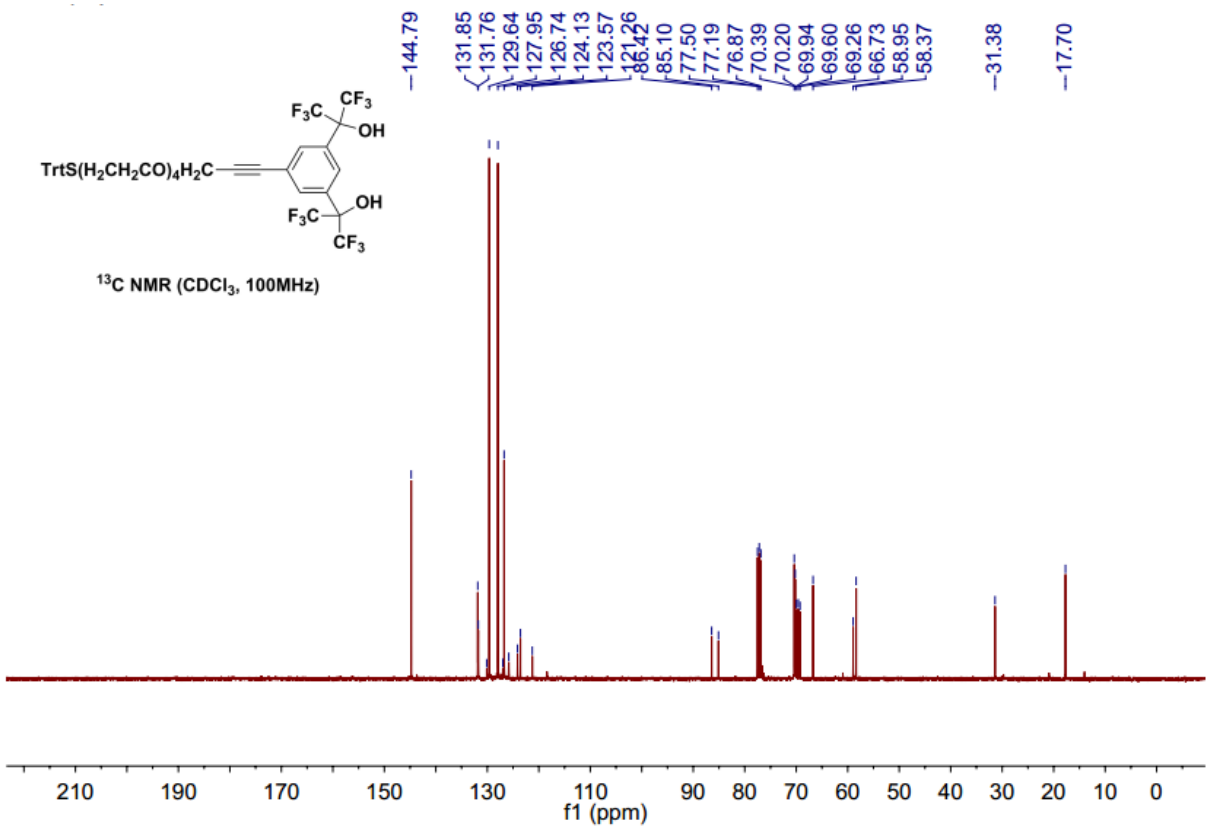

Compound **13**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



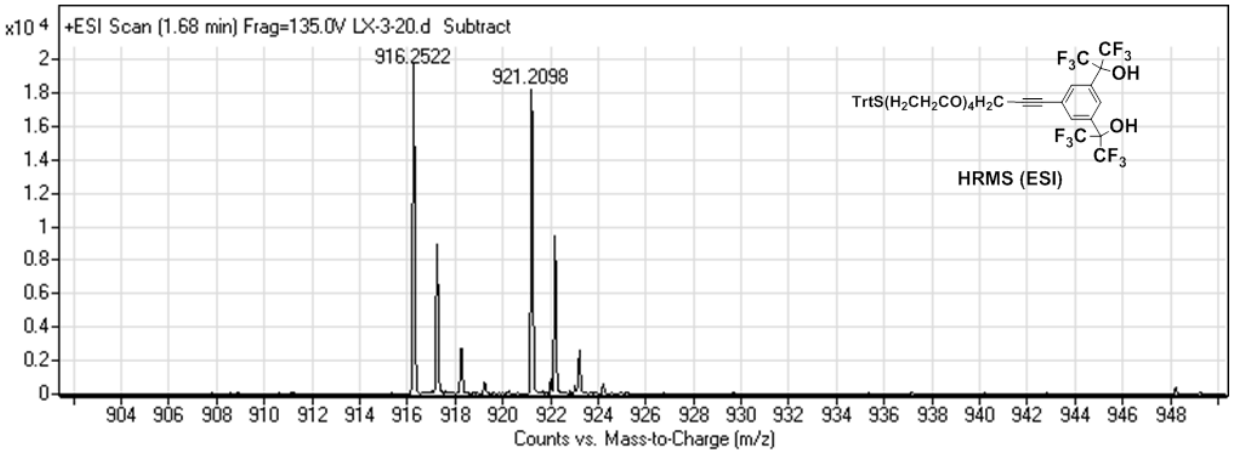
Compound **13**, $^{19}F$ NMR ($CDCl_3$, 376 MHz)



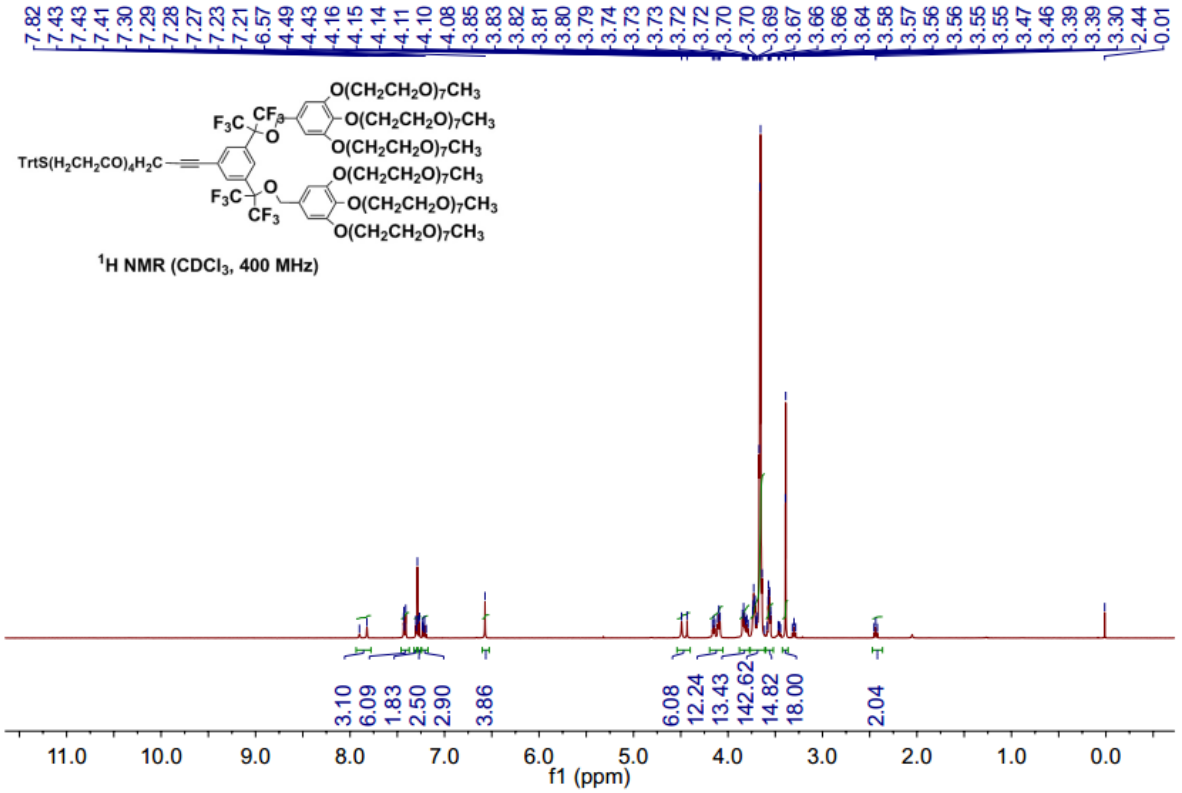

Compound **13**, $^{13}C$ NMR ($CDCl_3$, 100 MHz)



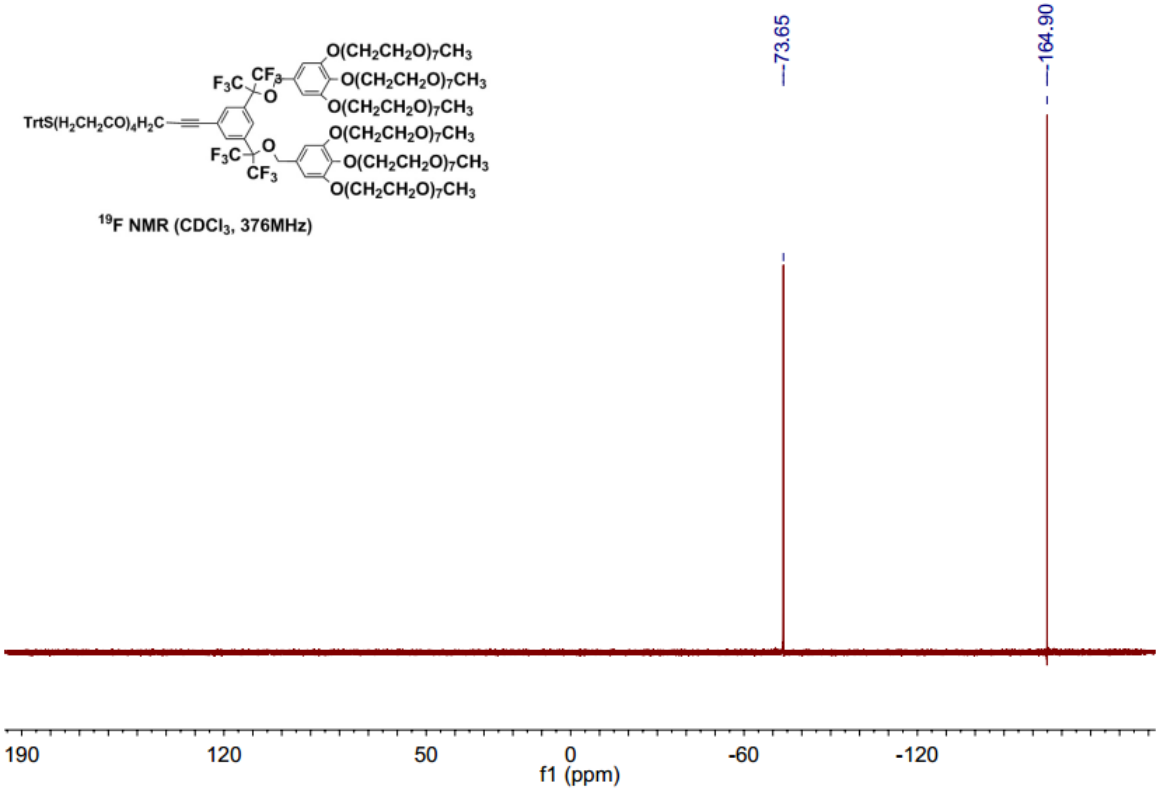
Compound **13**, HRMS (ESI)



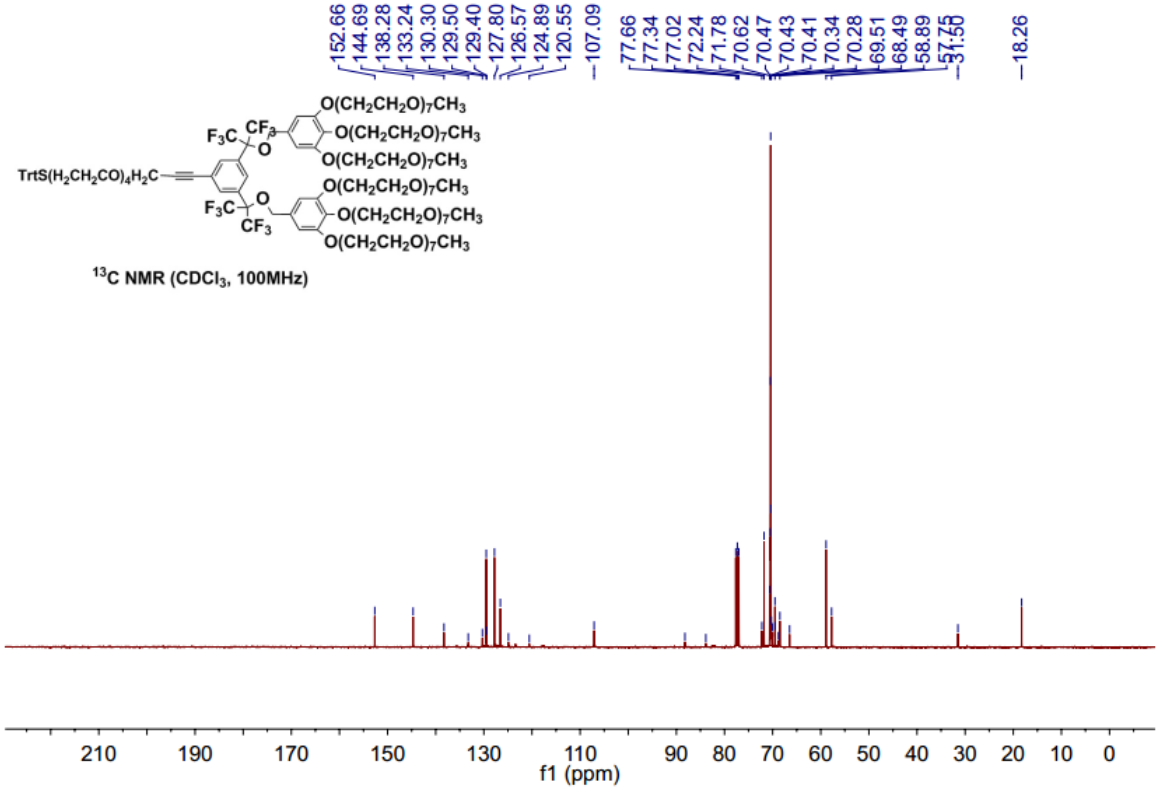

Compound **14**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



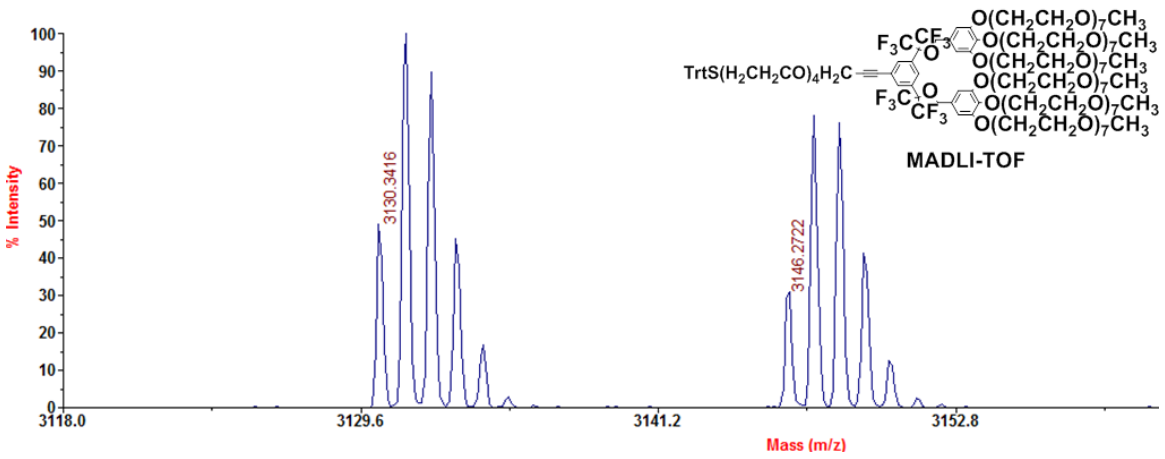
Compound **14**, $^{19}F$ NMR ($CDCl_3$, 376 MHz)



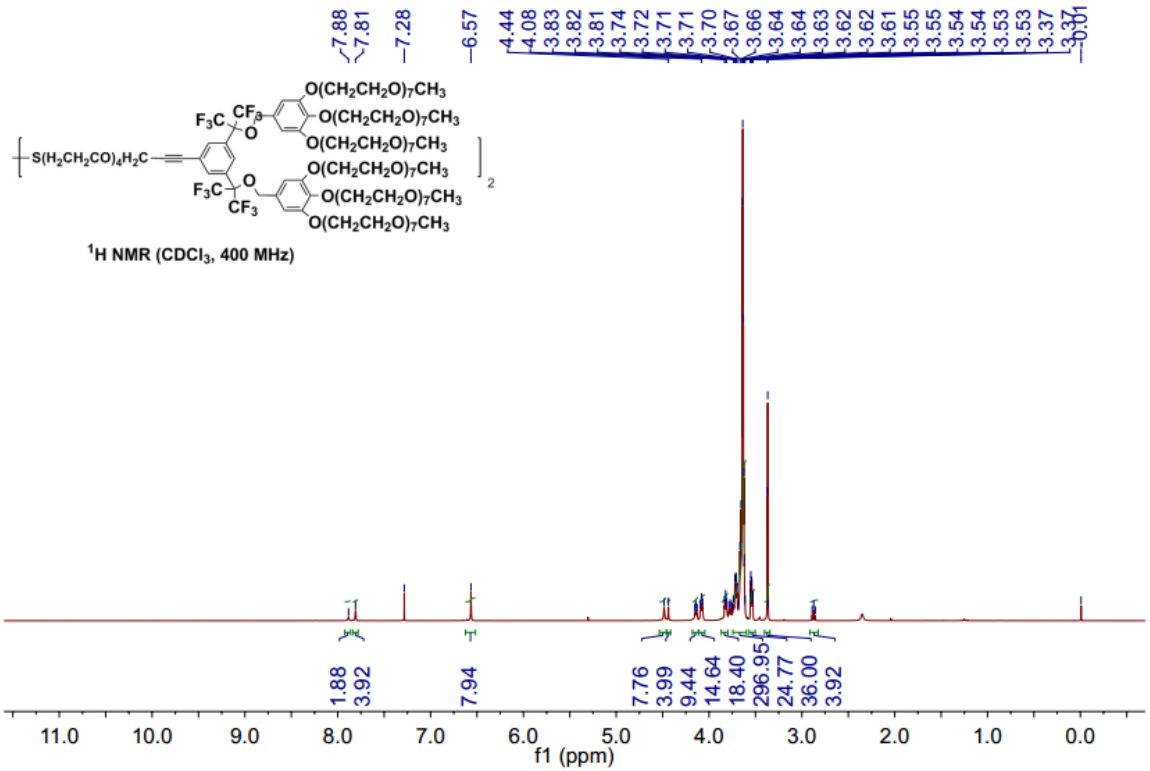

Compound **14**, $^{13}C$ NMR ($CDCl_3$, 100 MHz)



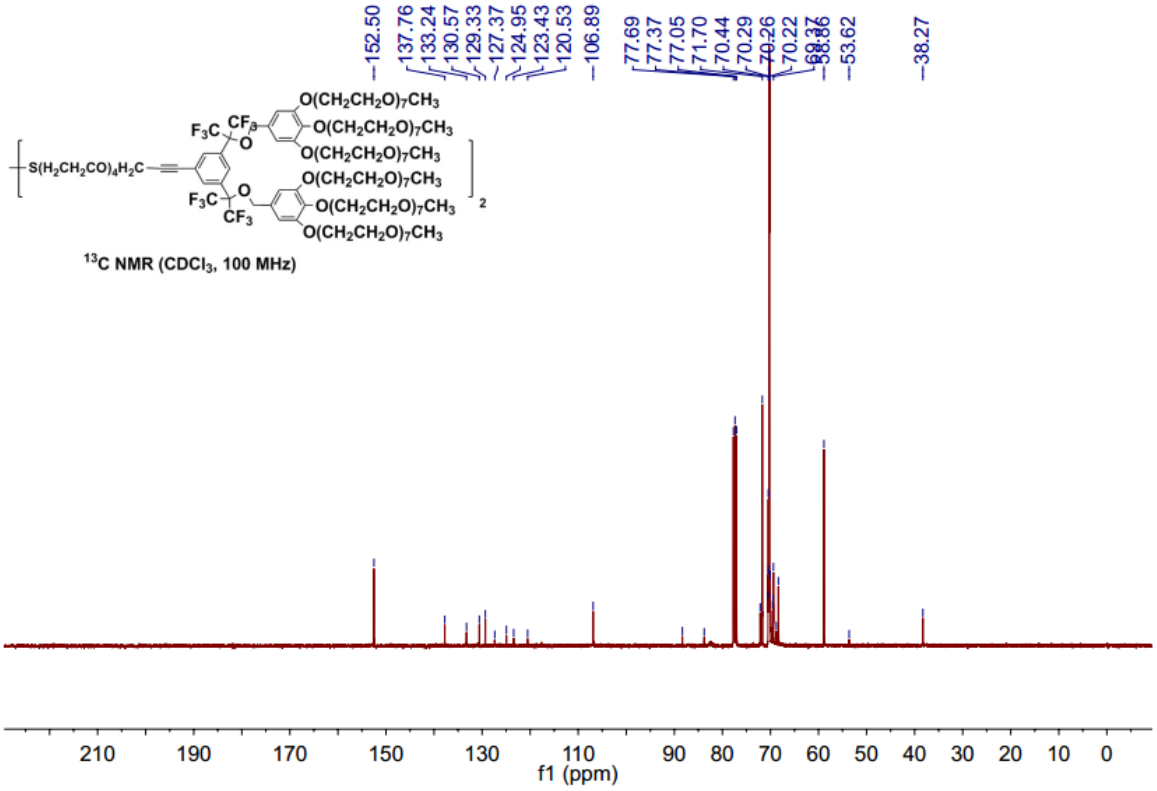
Compound **14**, MADLI-TOF



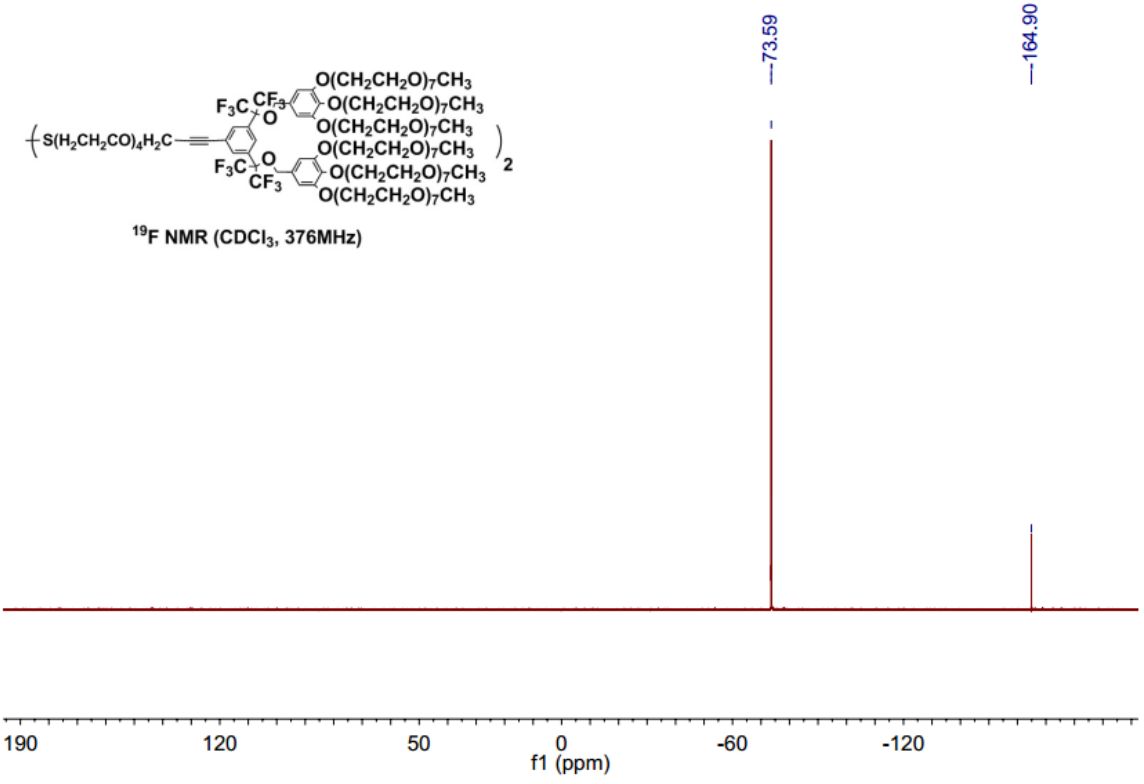

Compound **1c**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



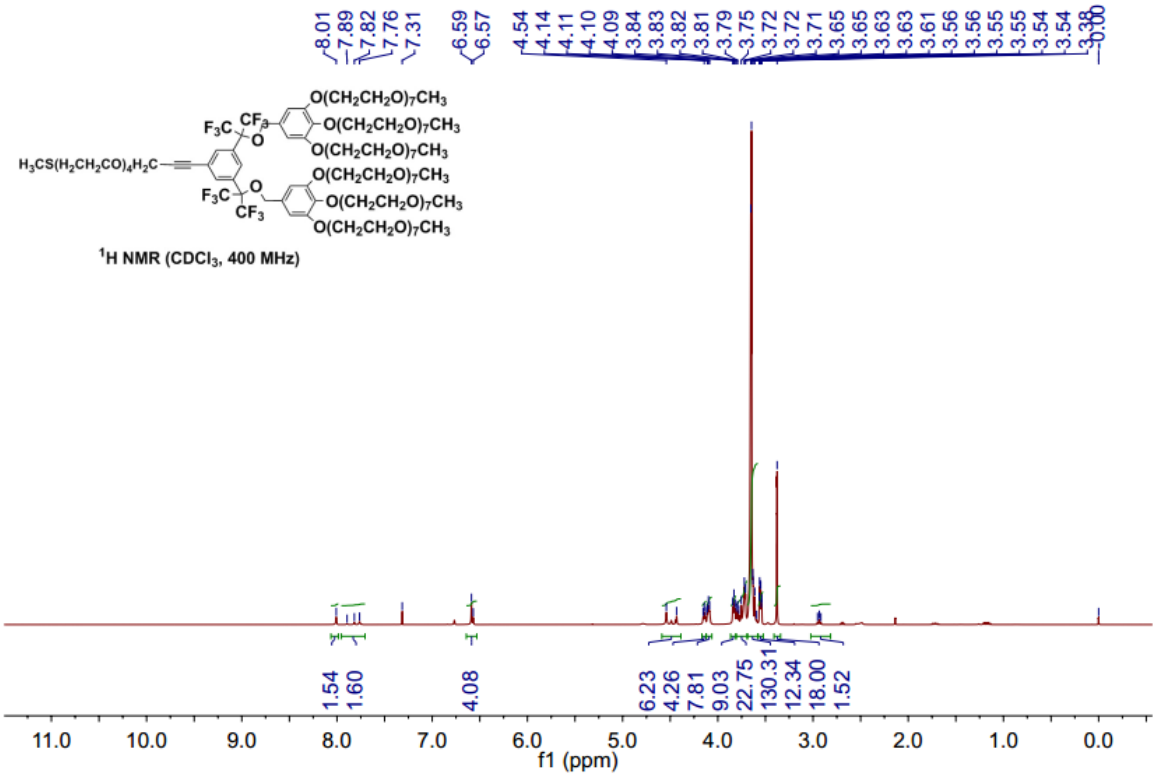
Compound **1c**, $^{13}C$ NMR ($CDCl_3$, 100 MHz)



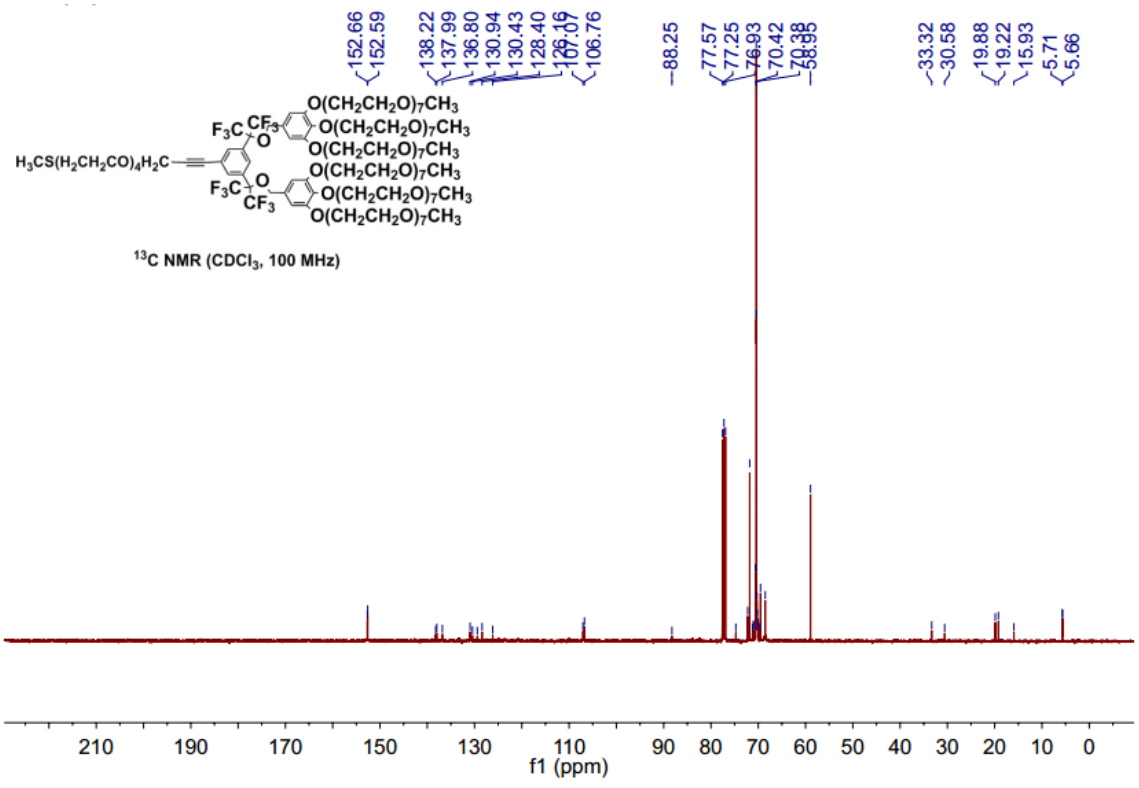

Compound **1c**, $^{19}F$ NMR ($CDCl_3$, 376 MHz)



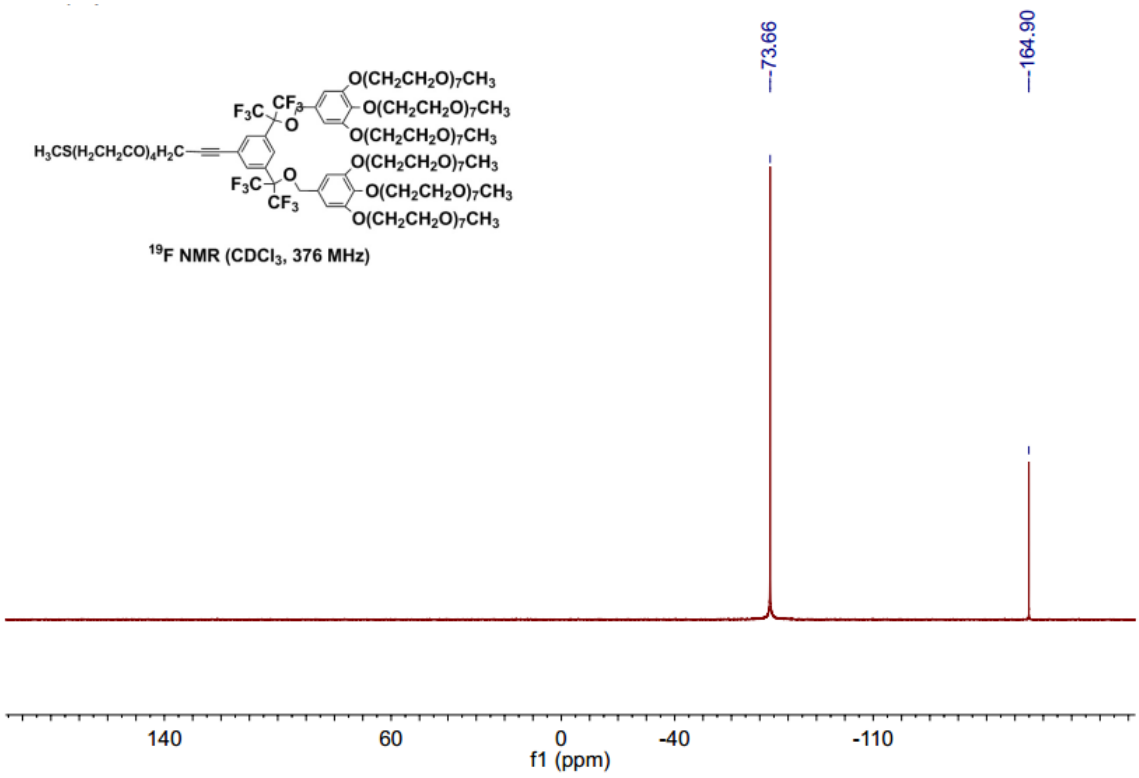
Compound **1b**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



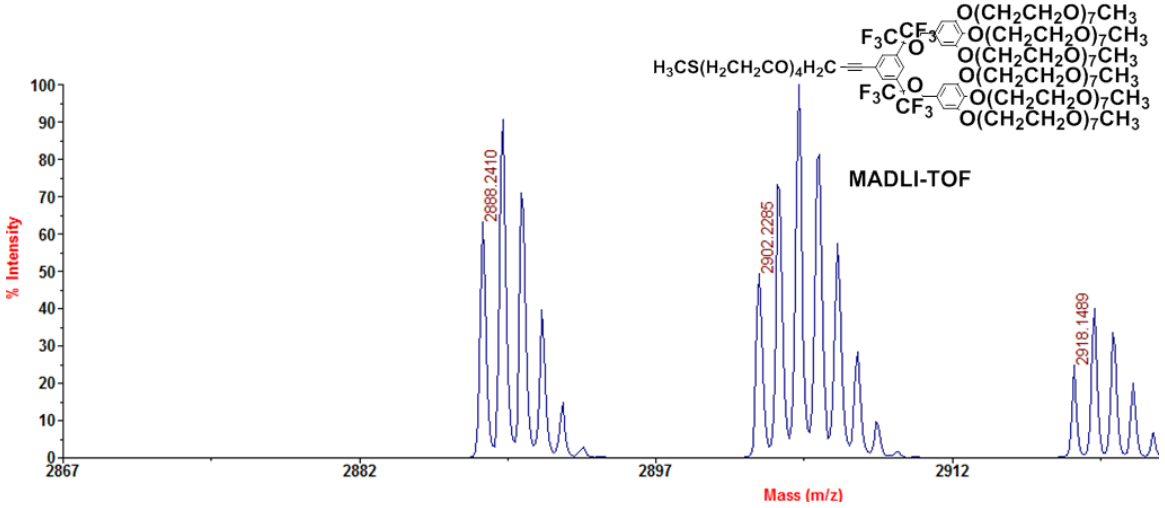

Compound **1b**, $^{13}$C NMR ($CDCl_3$, 100 MHz)



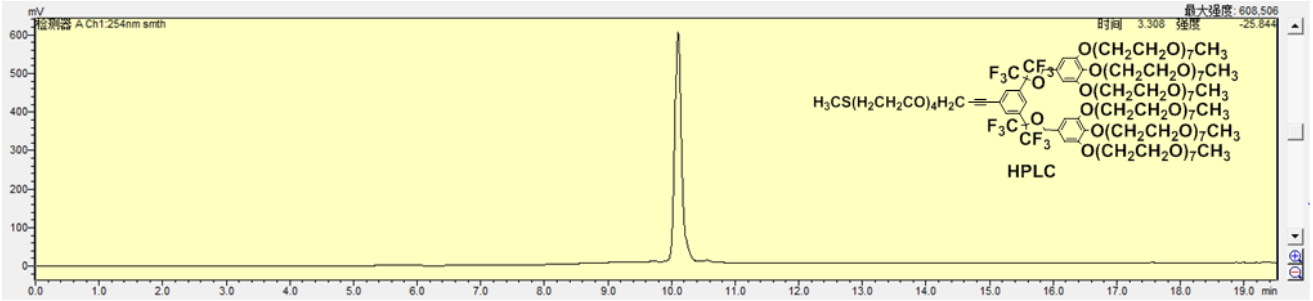
Compound **1b**, $^{19}F$ NMR ($CDCl_3$, 376 MHz)



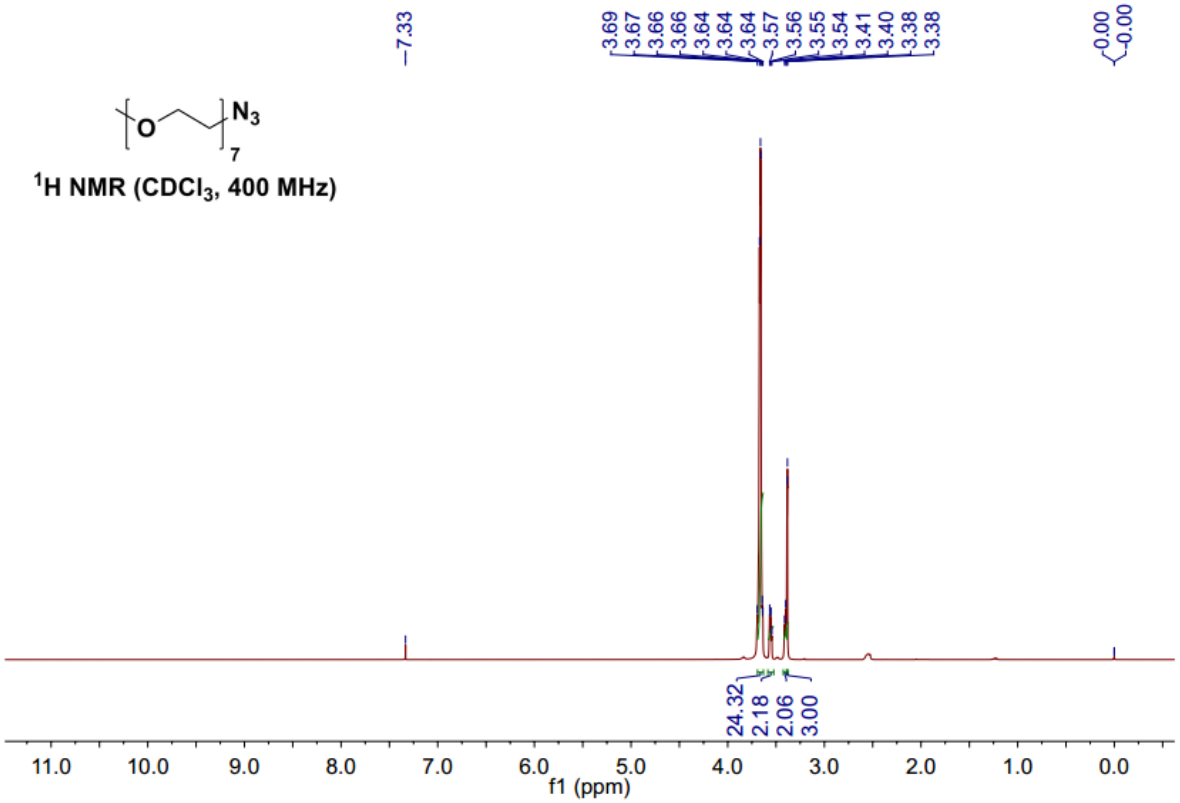

Compound **1b,** MADLI-TOF



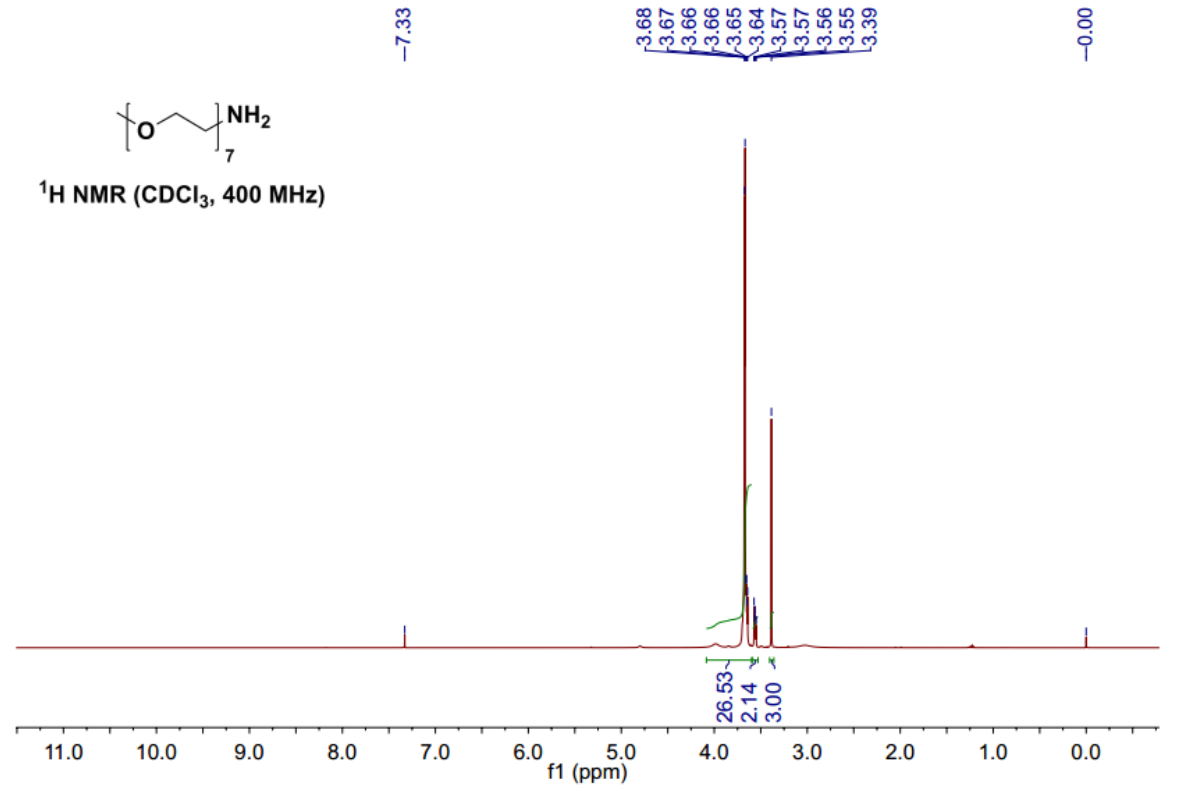

Compound **1b**, HPLC



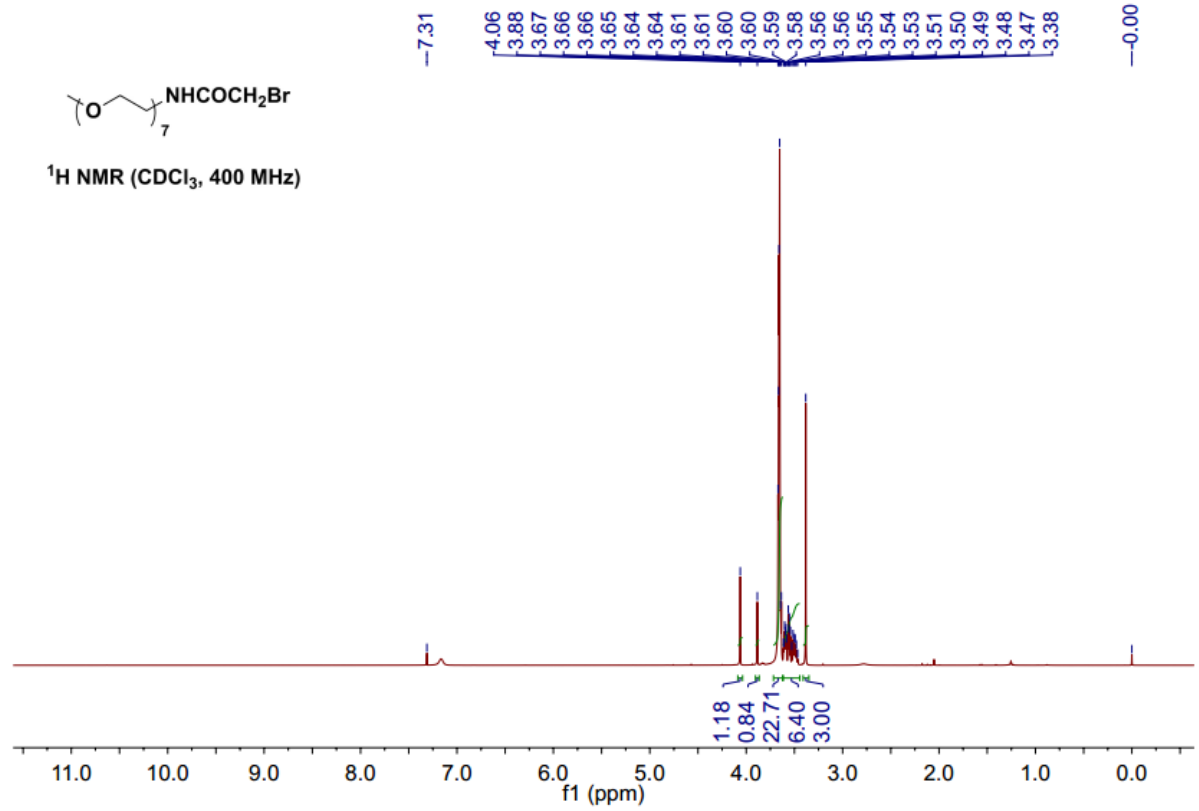
Compound **15**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



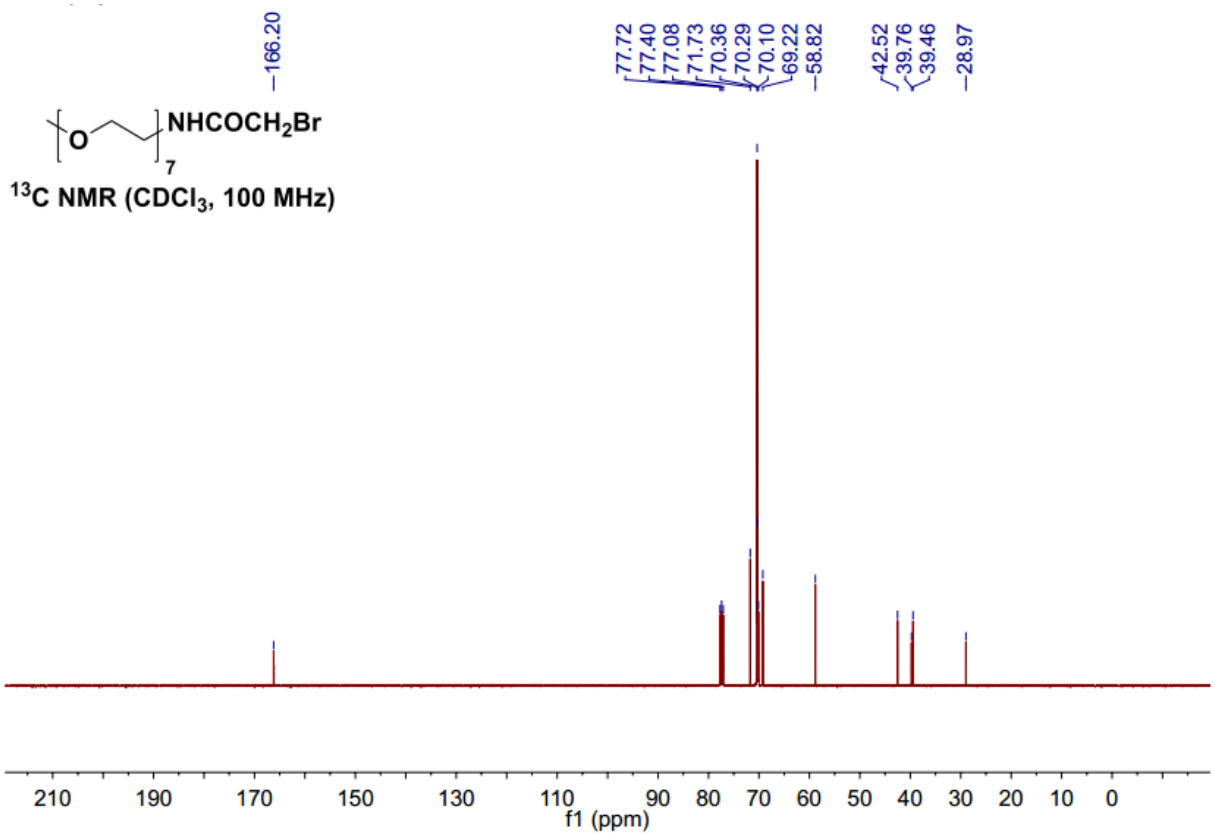

Compound **16**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



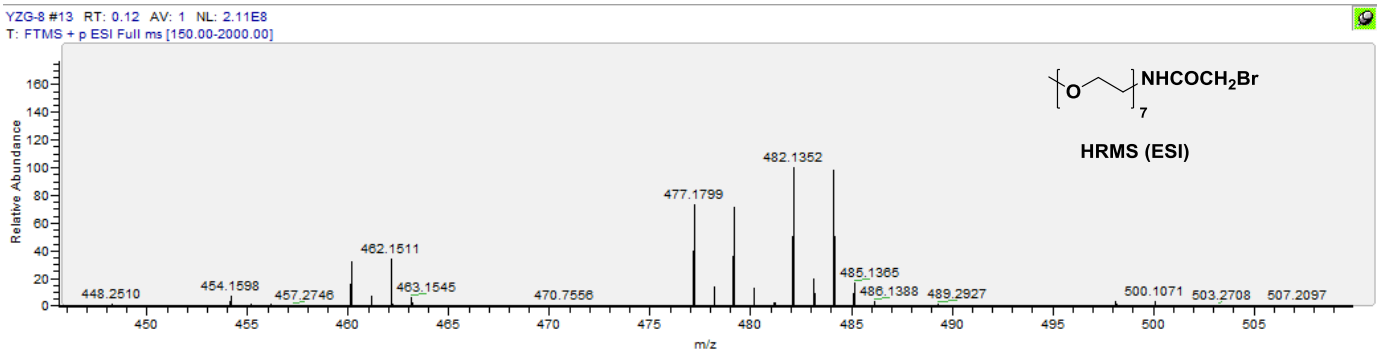
Compound **17**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



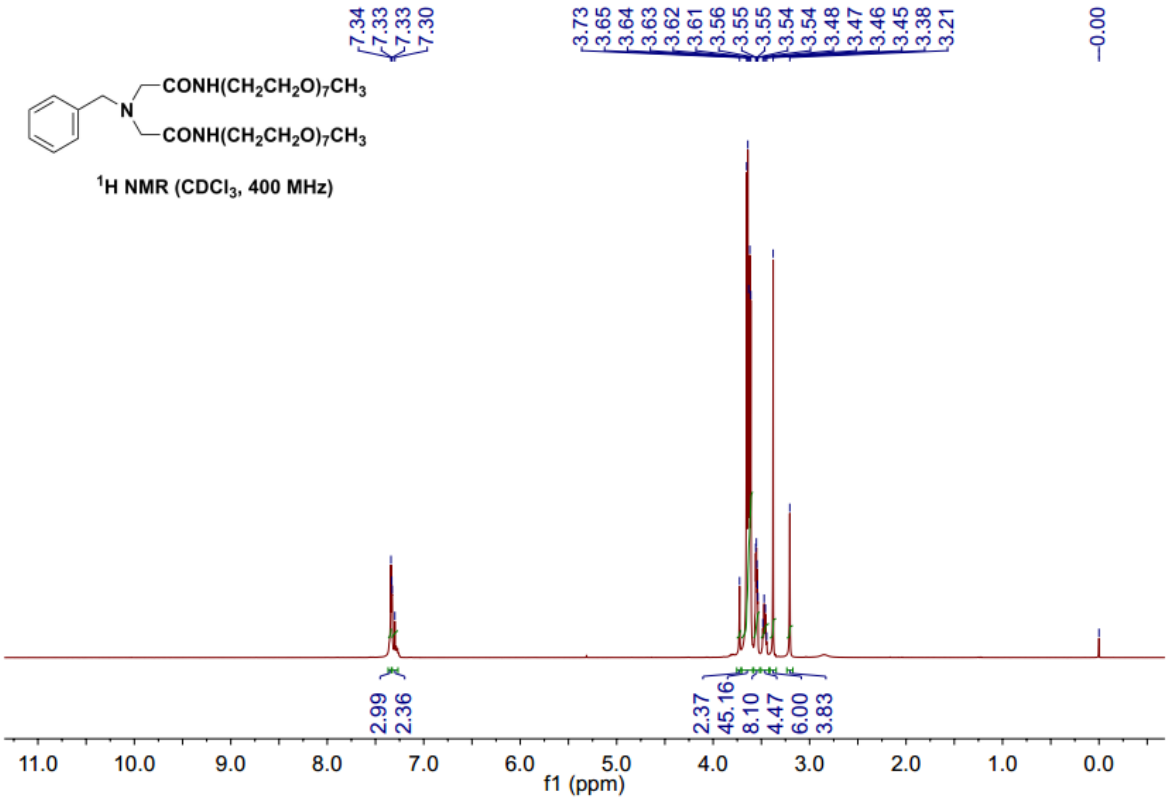

Compound **17**, $^{13}$C NMR ($CDCl_3$, 100 MHz)



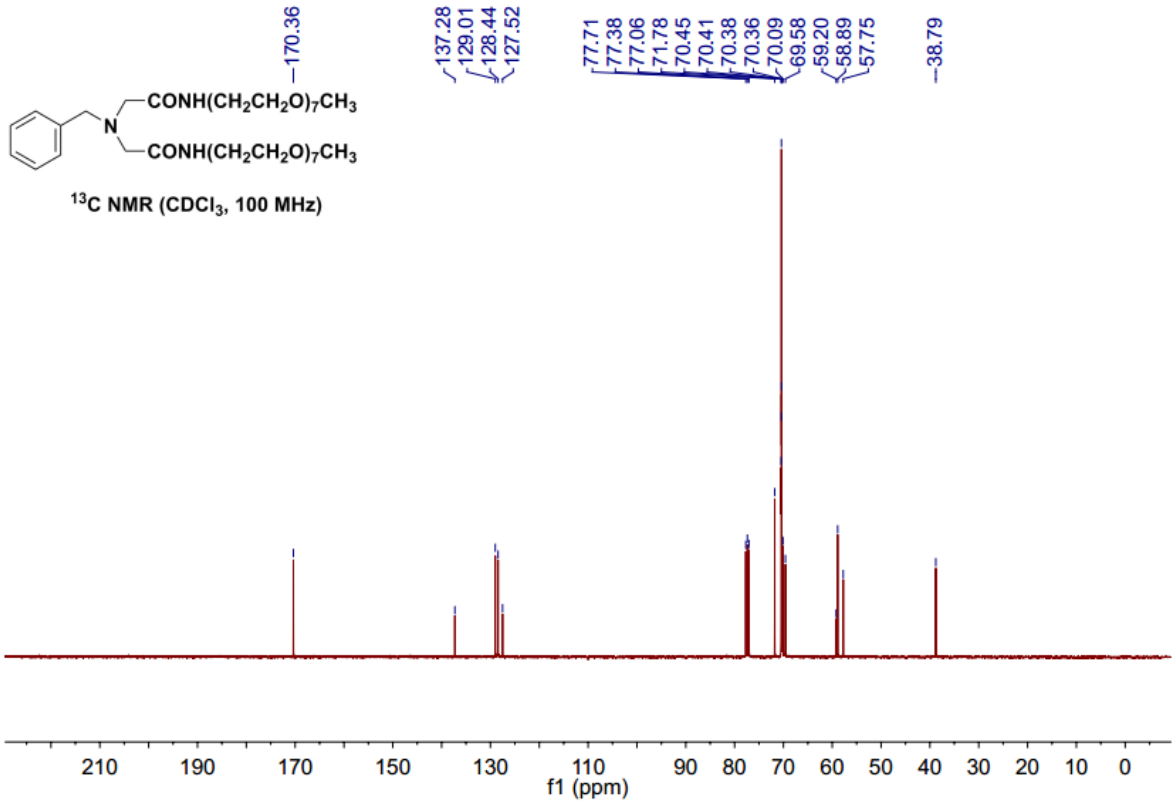
Compound **17**, HRMS (ESI)



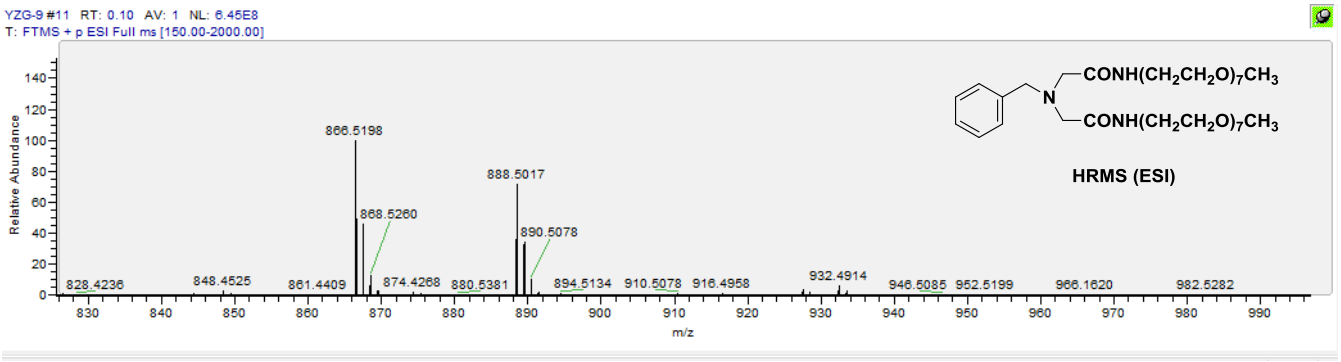

Compound **18**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



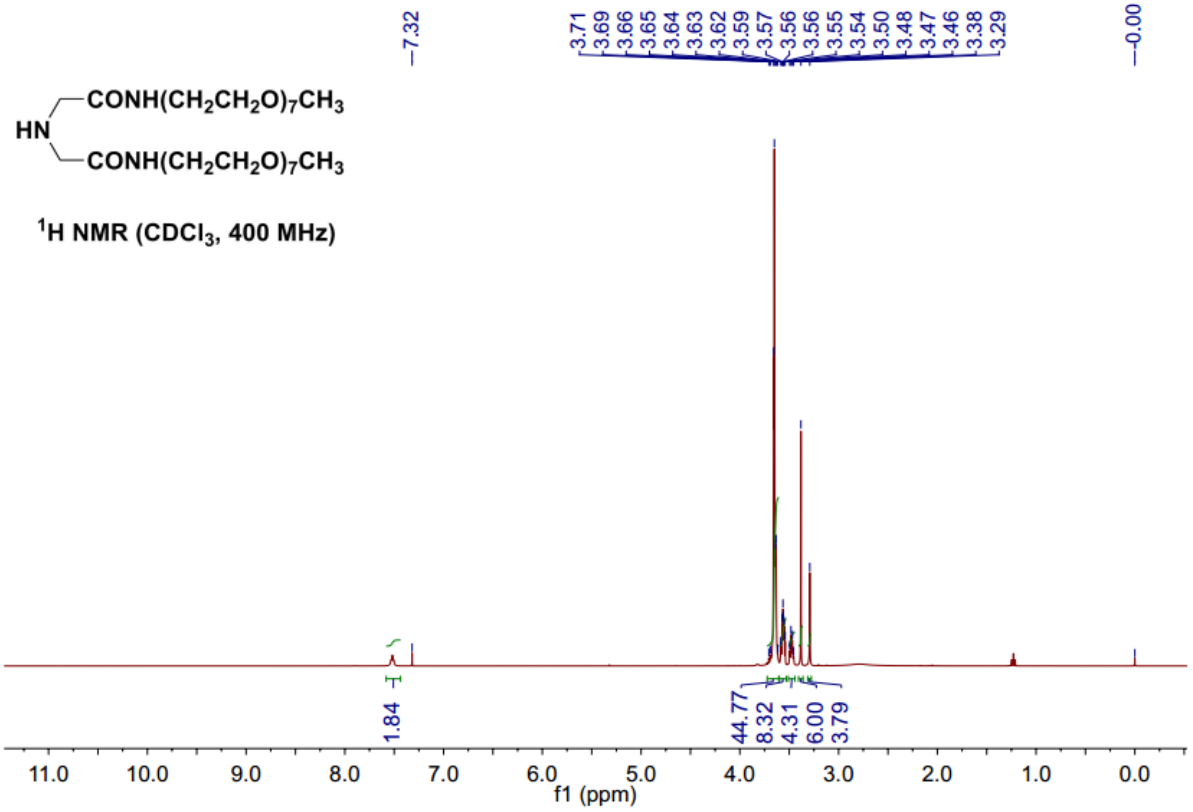
Compound **18**, $^{13}C$ NMR ($CDCl_3$, 100 MHz)



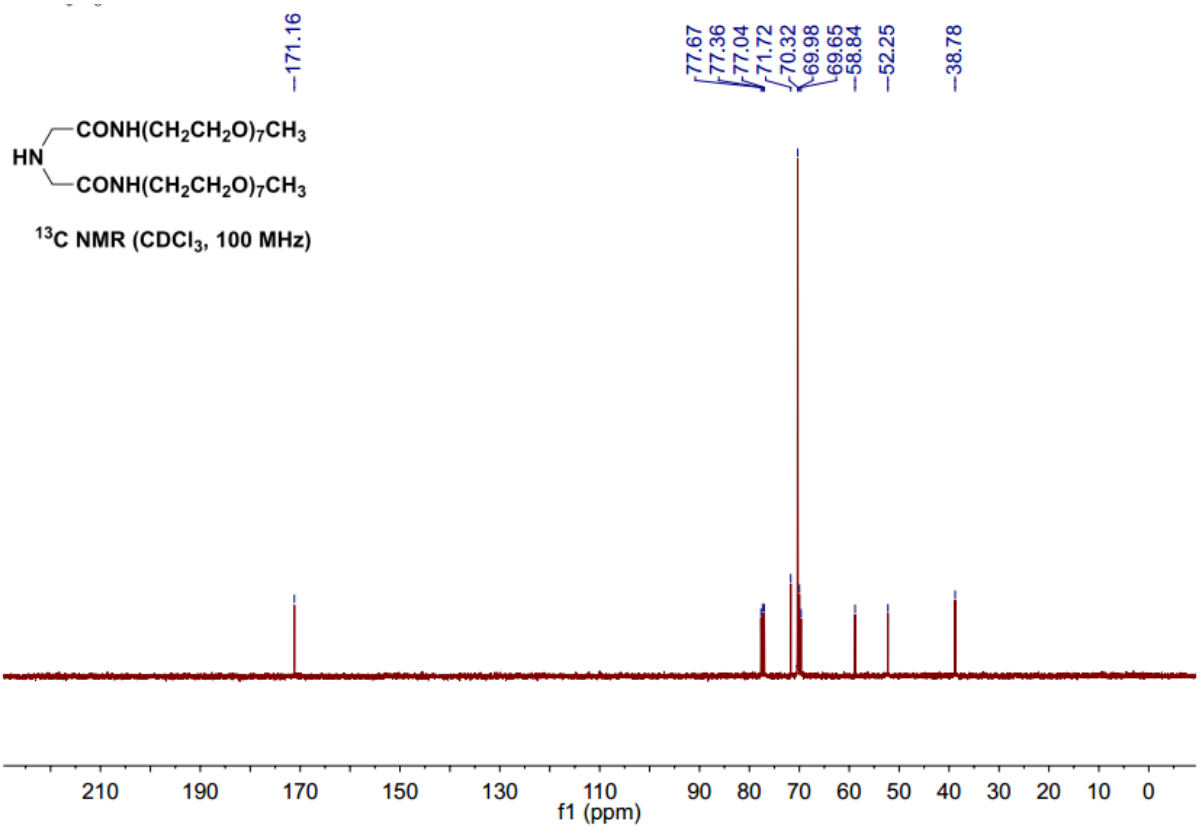

Compound **18**, HRMS (ESI)



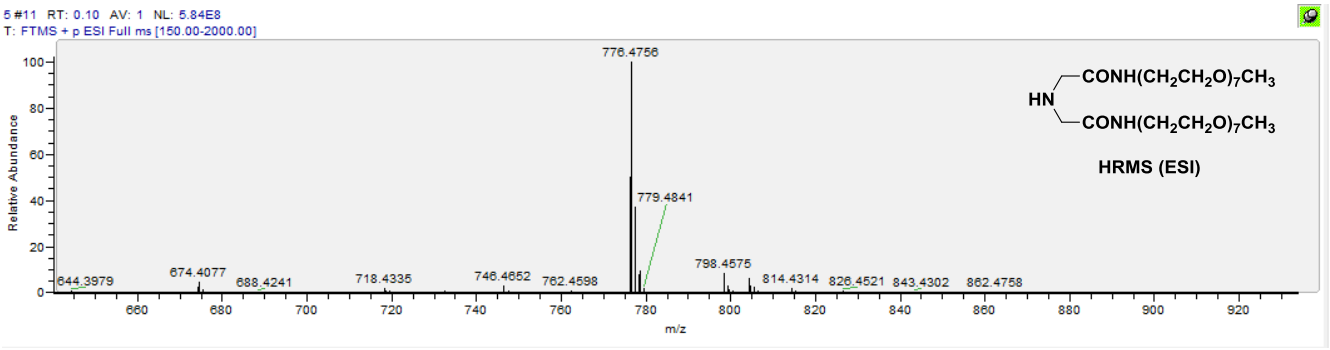
Compound **19**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



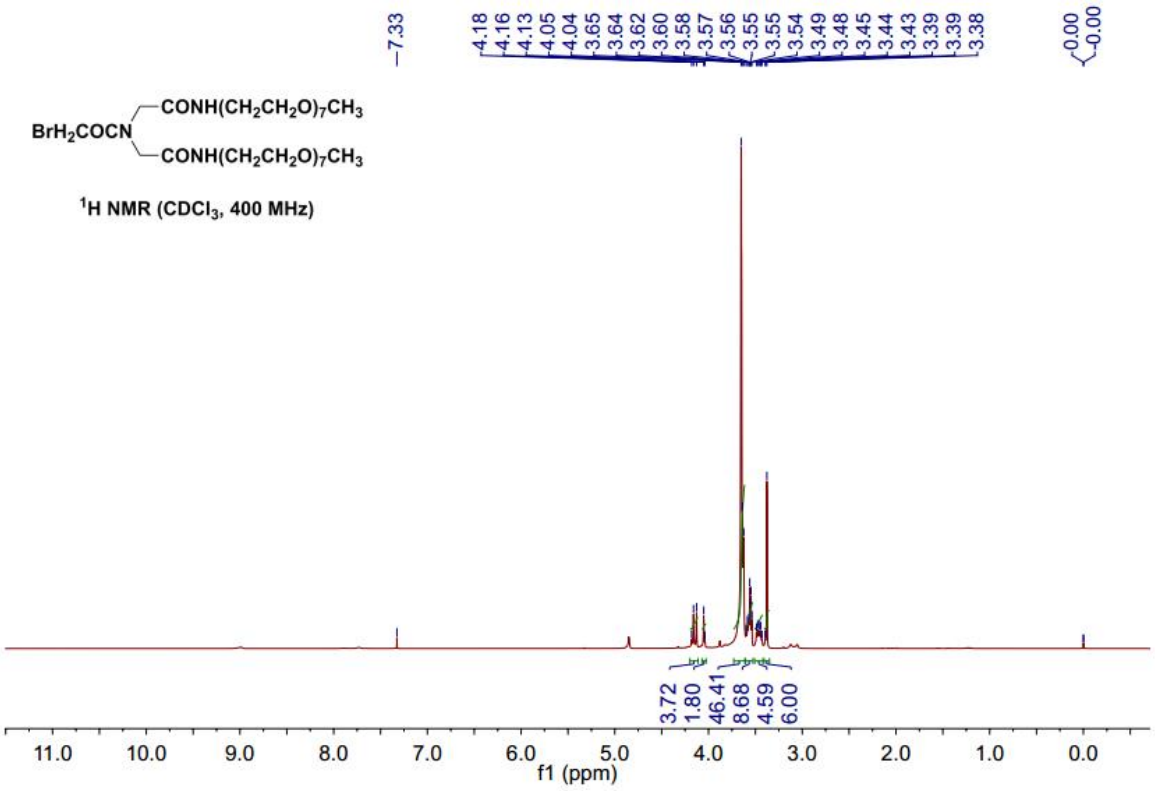

Compound **19**, $^{13}$C NMR ($CDCl_3$, 100 MHz)



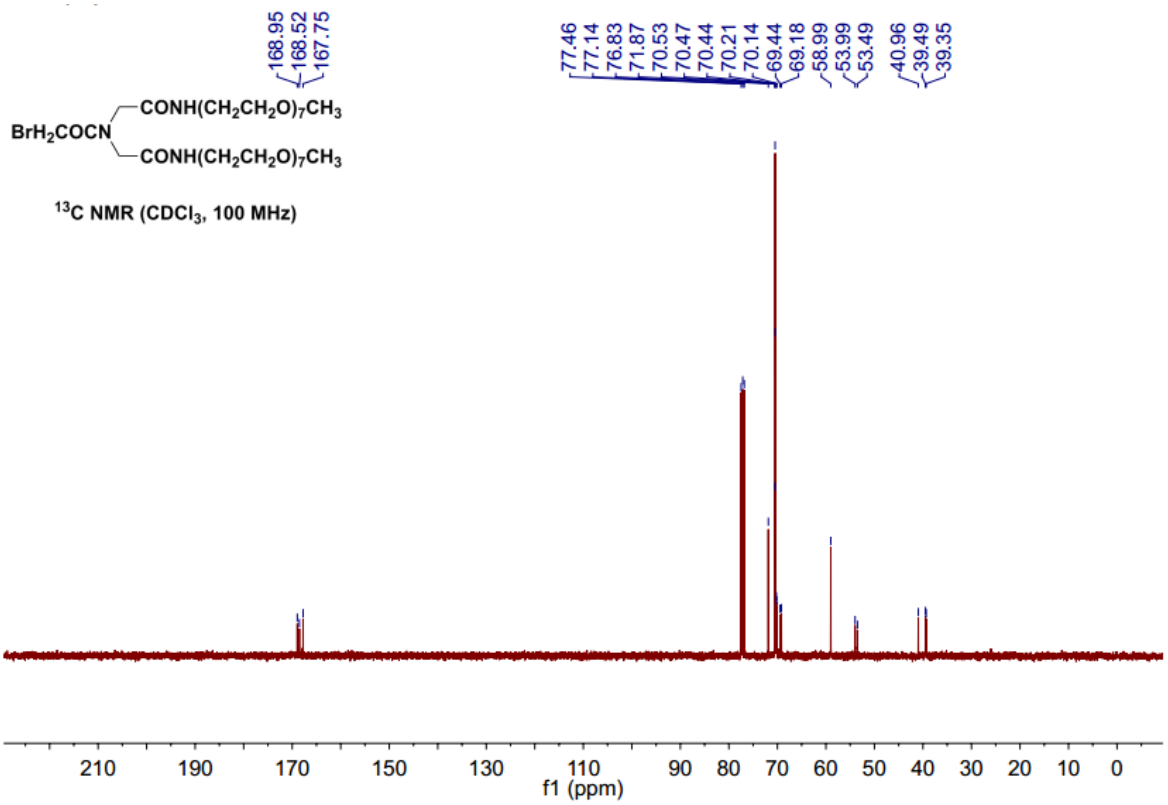
Compound **19**, HRMS (ESI)



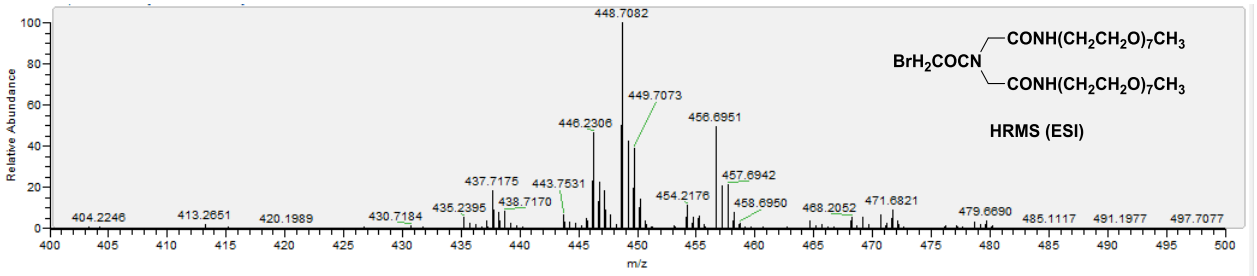

Compound **20**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



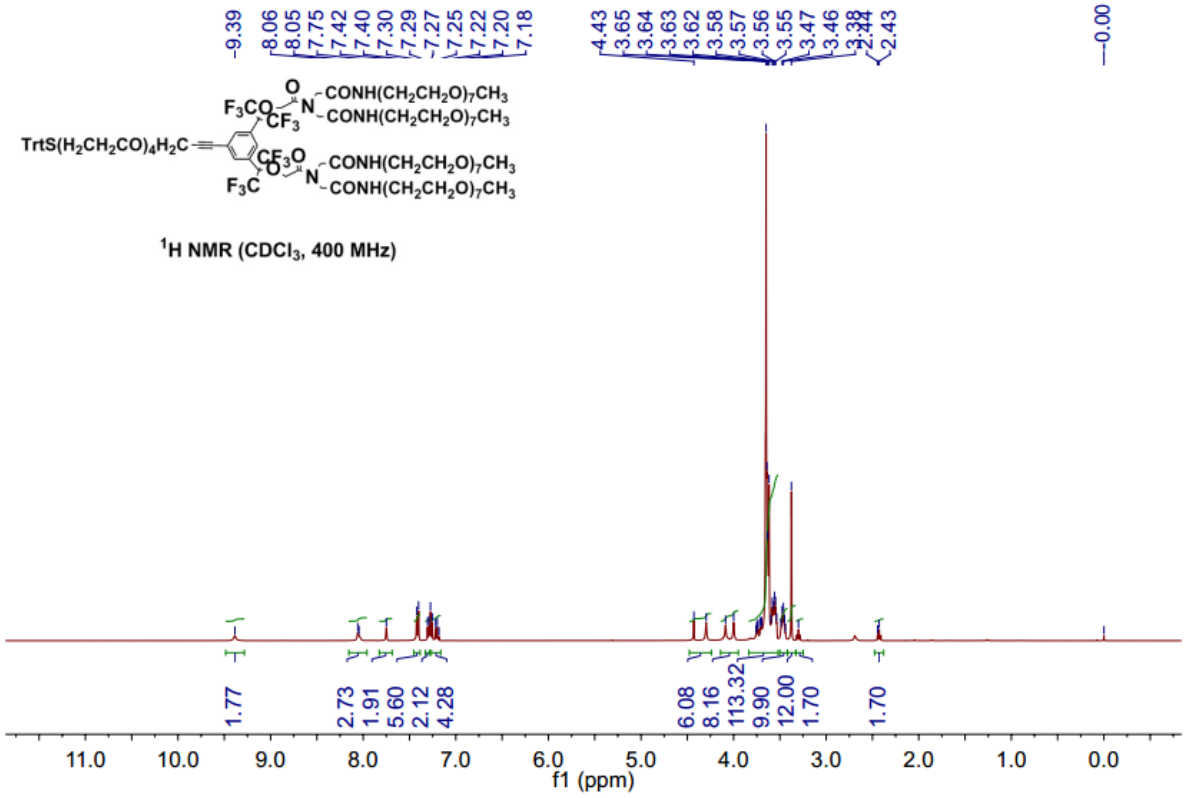
Compound **20**, $^{13}C$ NMR ($CDCl_3$, 100 MHz)



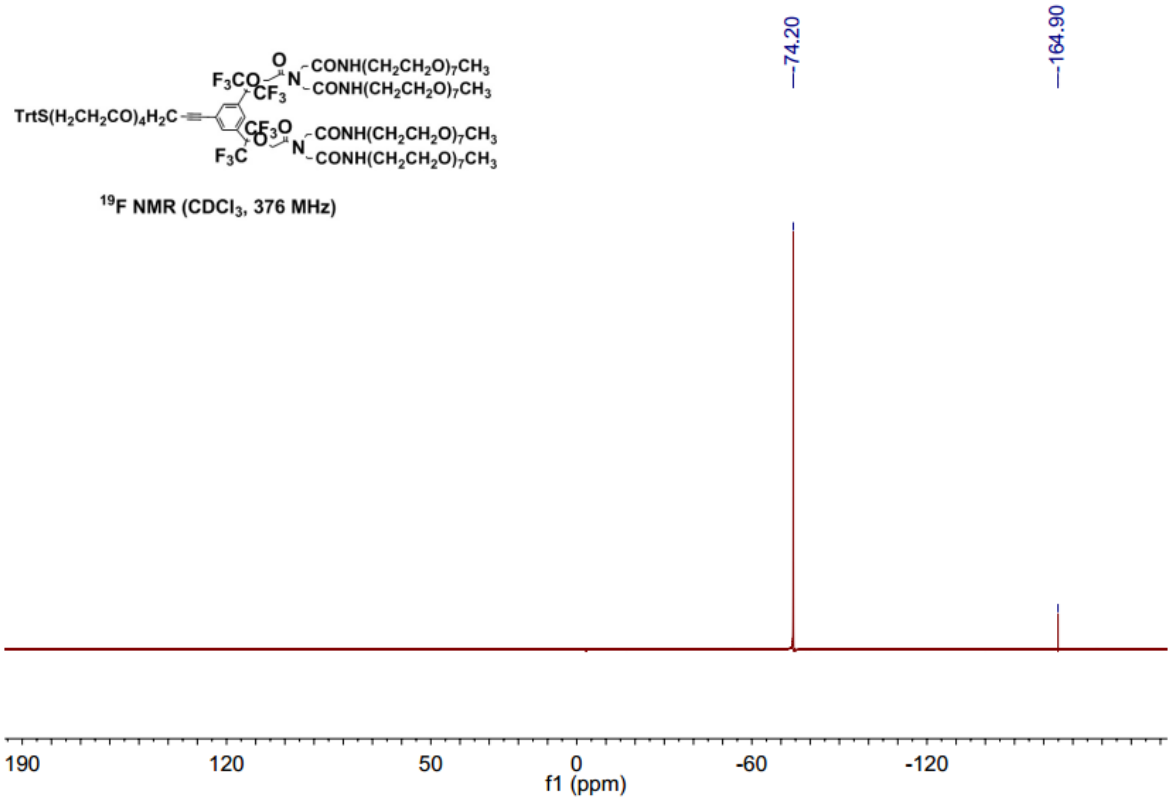

Compound **20**, HRMS (ESI)



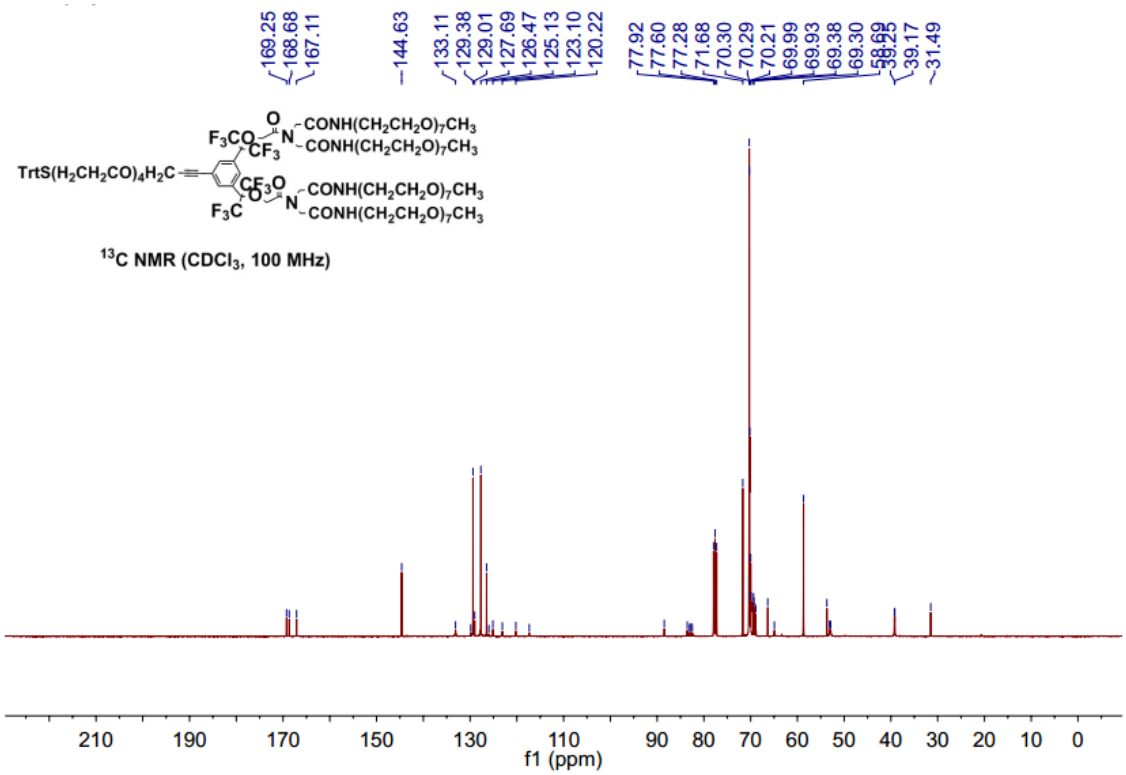
Compound **21**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



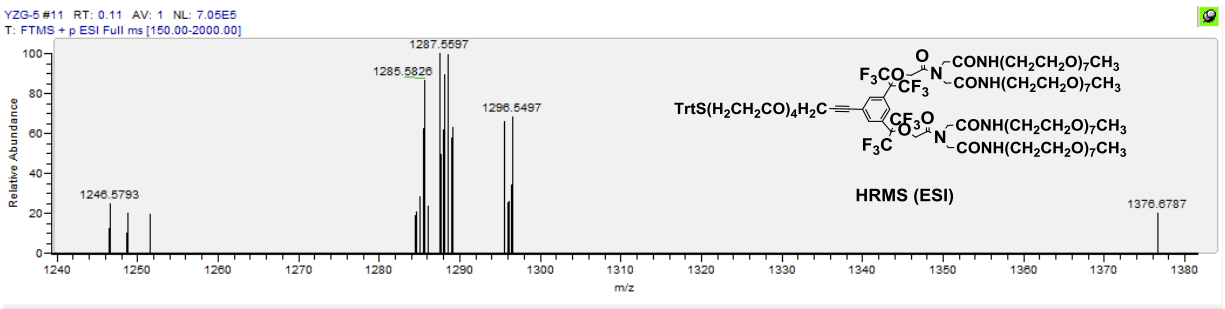

Compound **21**, $^{19}$F NMR ($CDCl_3$, 376 MHz)



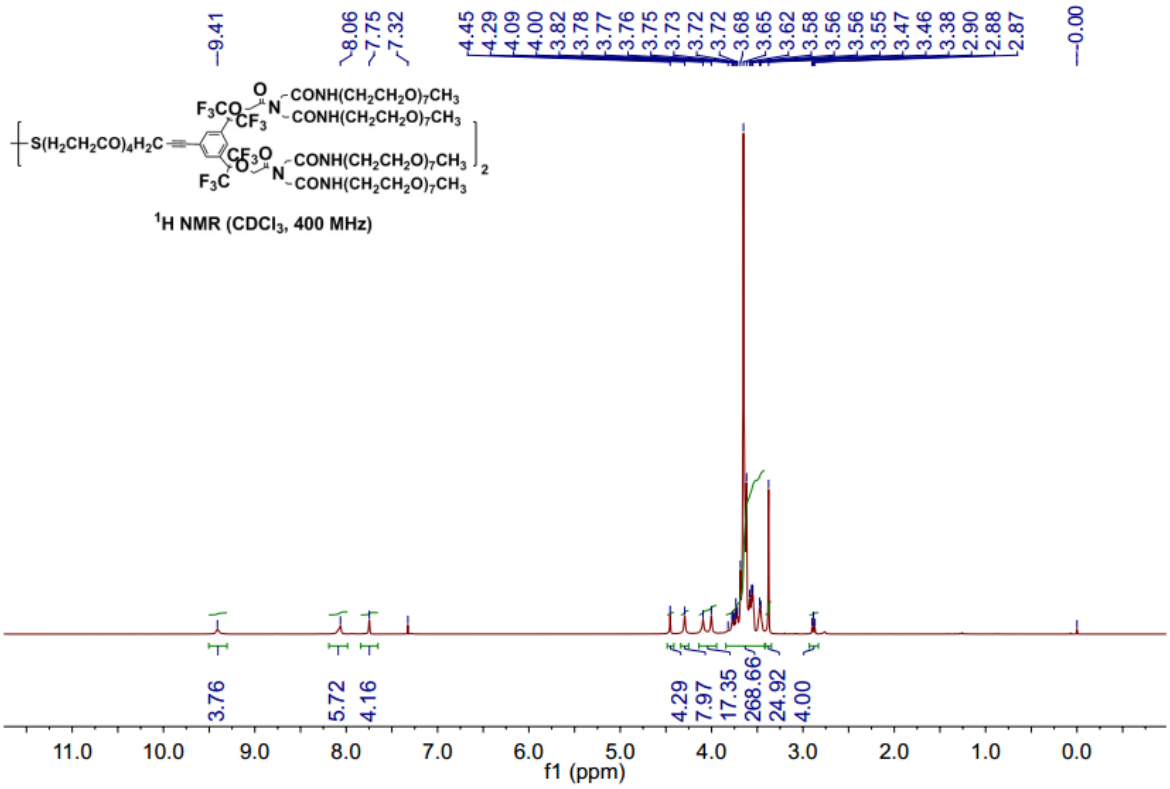
Compound **21**, $^{13}C$ NMR ($CDCl_3$, 100 MHz)



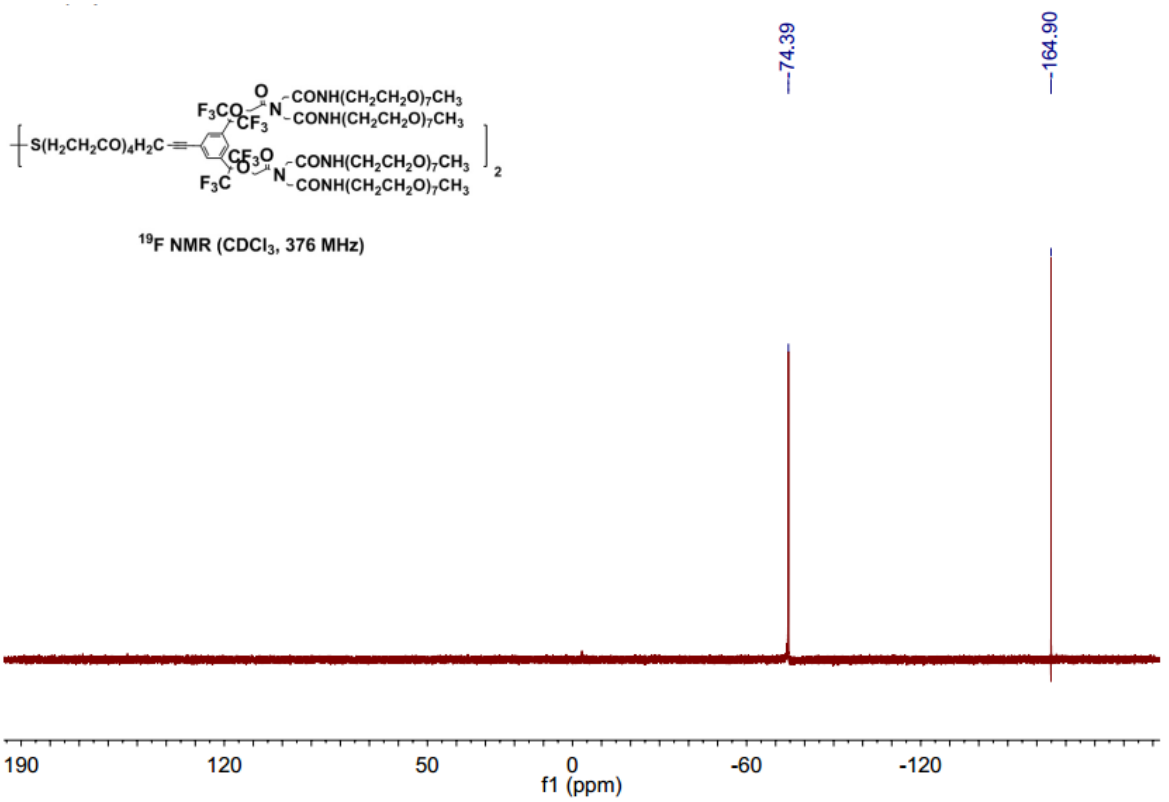

Compound **21**, HRMS (ESI)



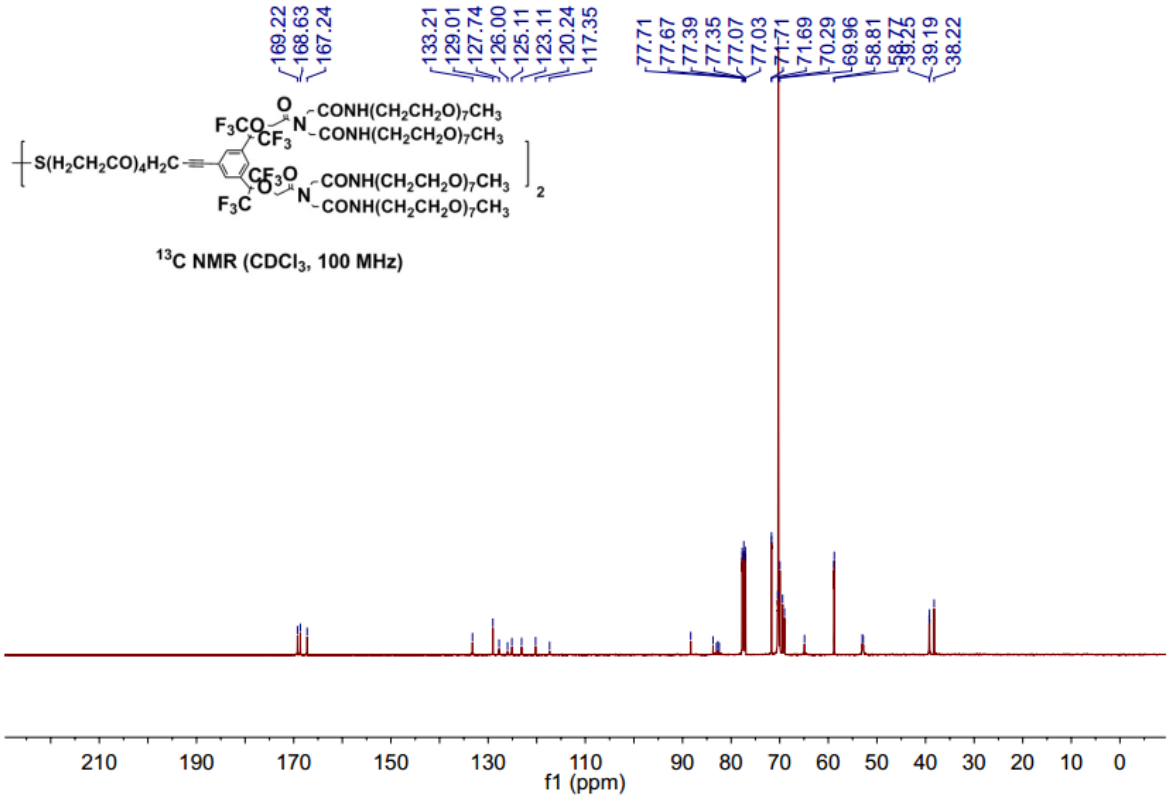
Compound **2c**, $^{1}$H NMR ($CDCl_3$, 400 MHz)



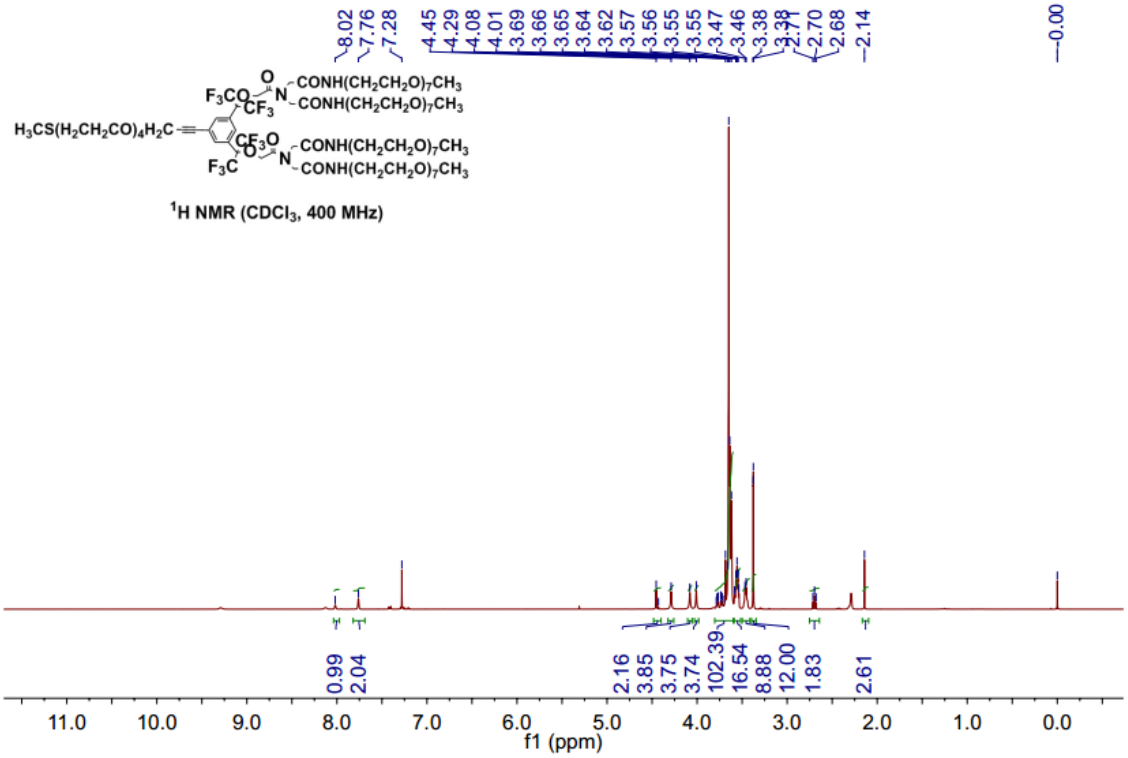

Compound **2c**, $^{19}$F NMR ($CDCl_3$, 376 MHz)



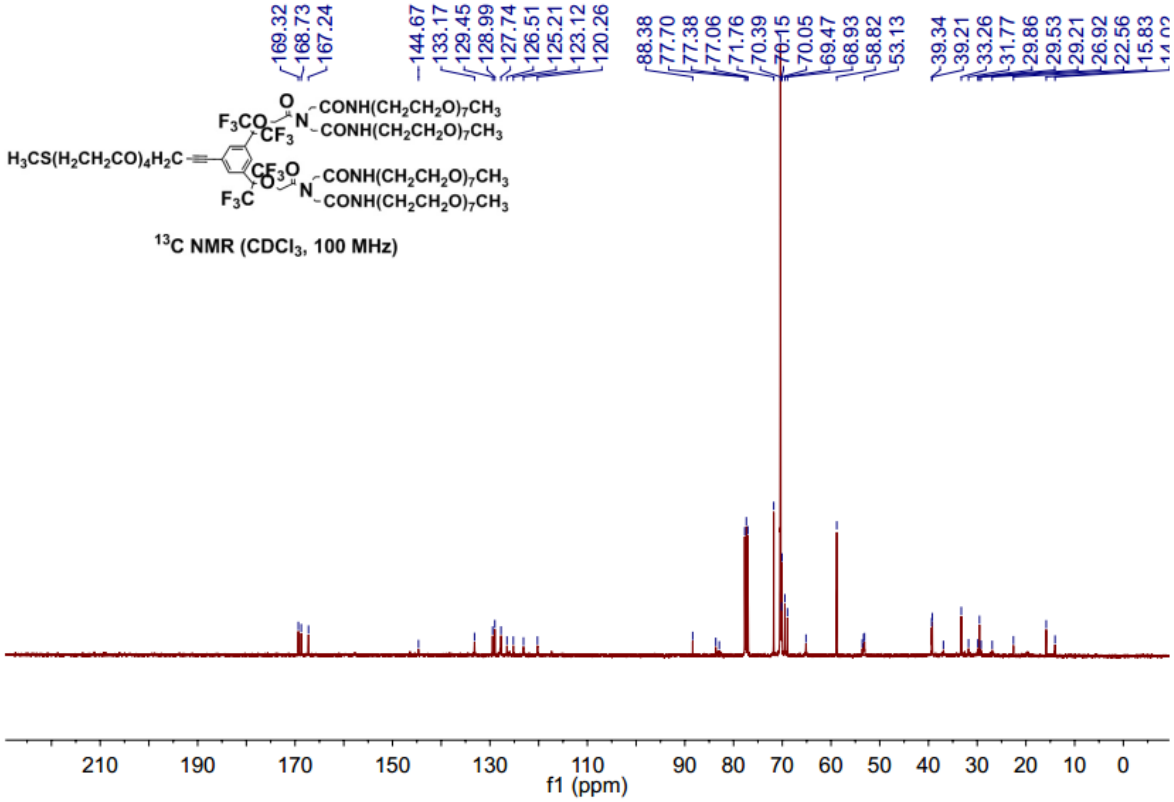
Compound **2c**, $^{13}C$ NMR ($CDCl_3$, 100 MHz)



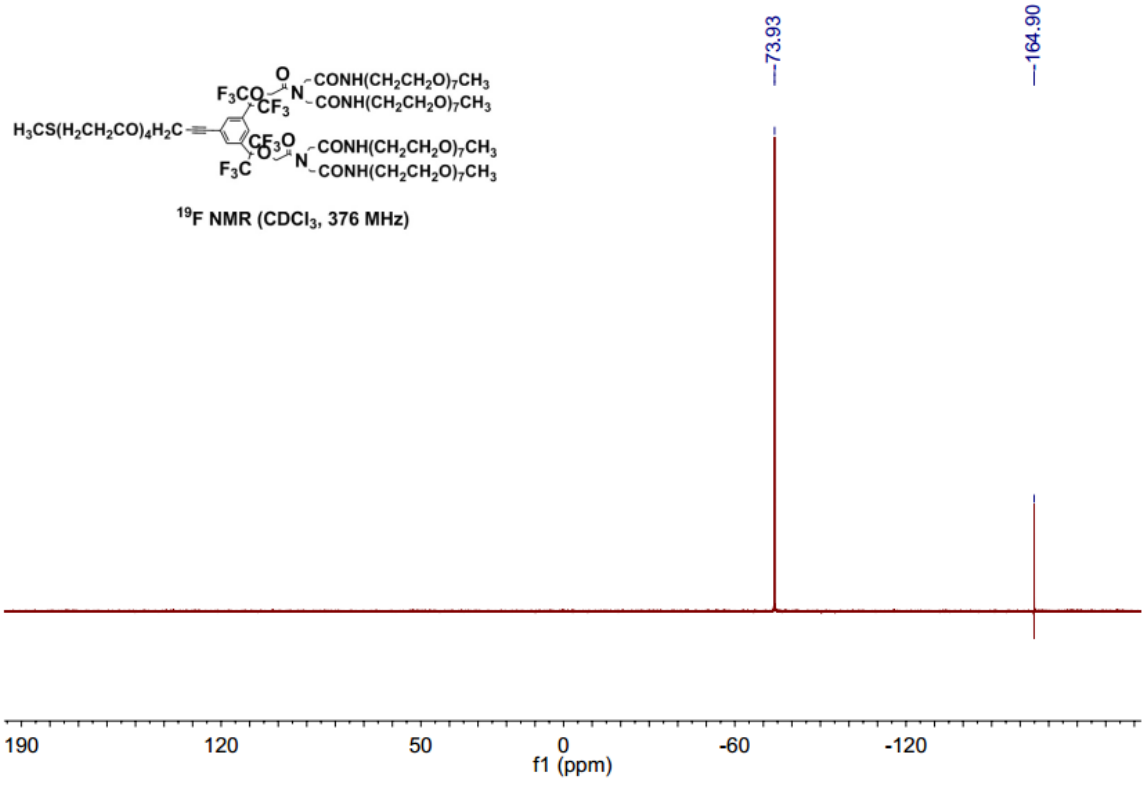

Compound **2b**, $^{1}H$ NMR ($CDCl_3$, 400 MHz)



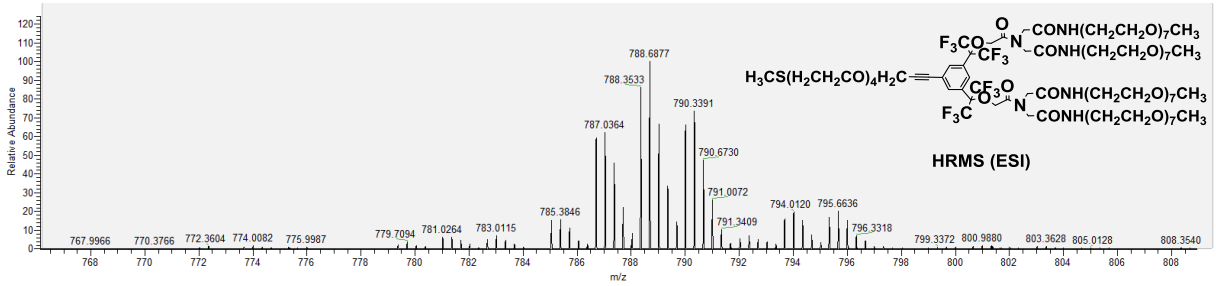
Compound **2b**, $^{13}C$ NMR ($CDCl_3$, 100 MHz)



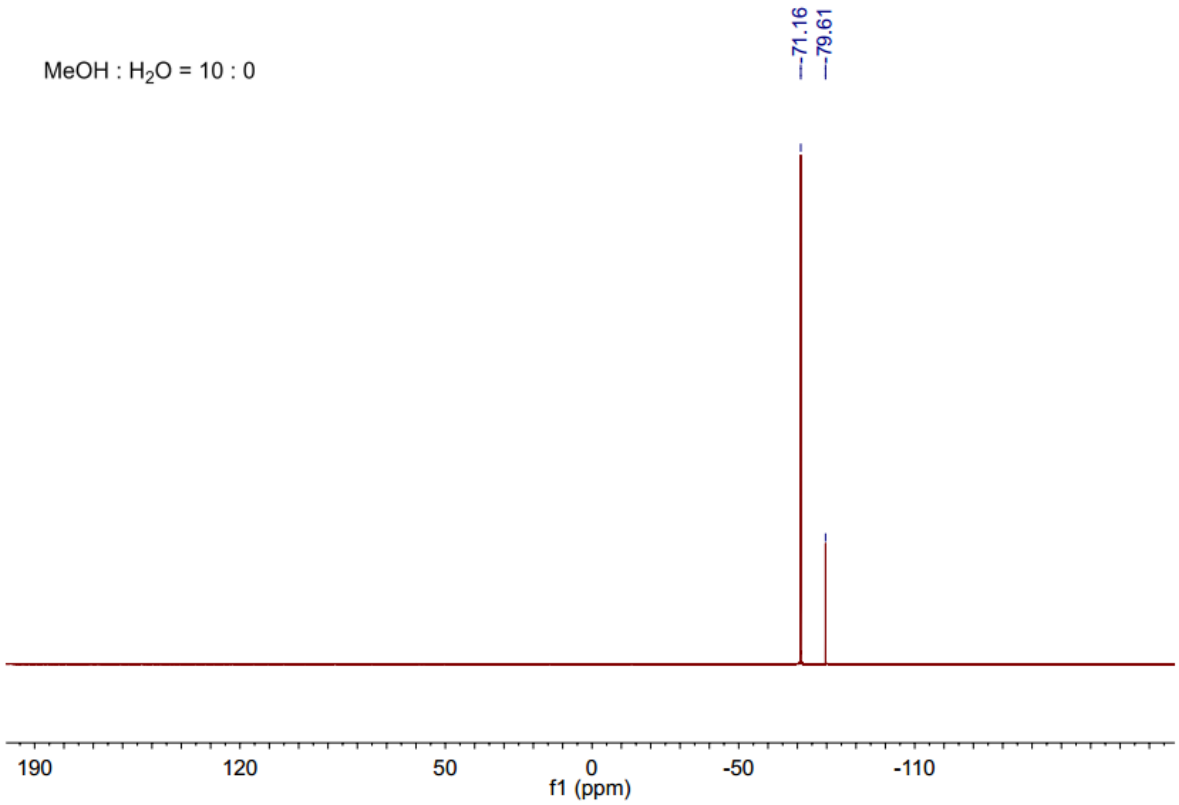

Compound **2b**, $^{19}F$ NMR ($CDCl_3$, 376 MHz)

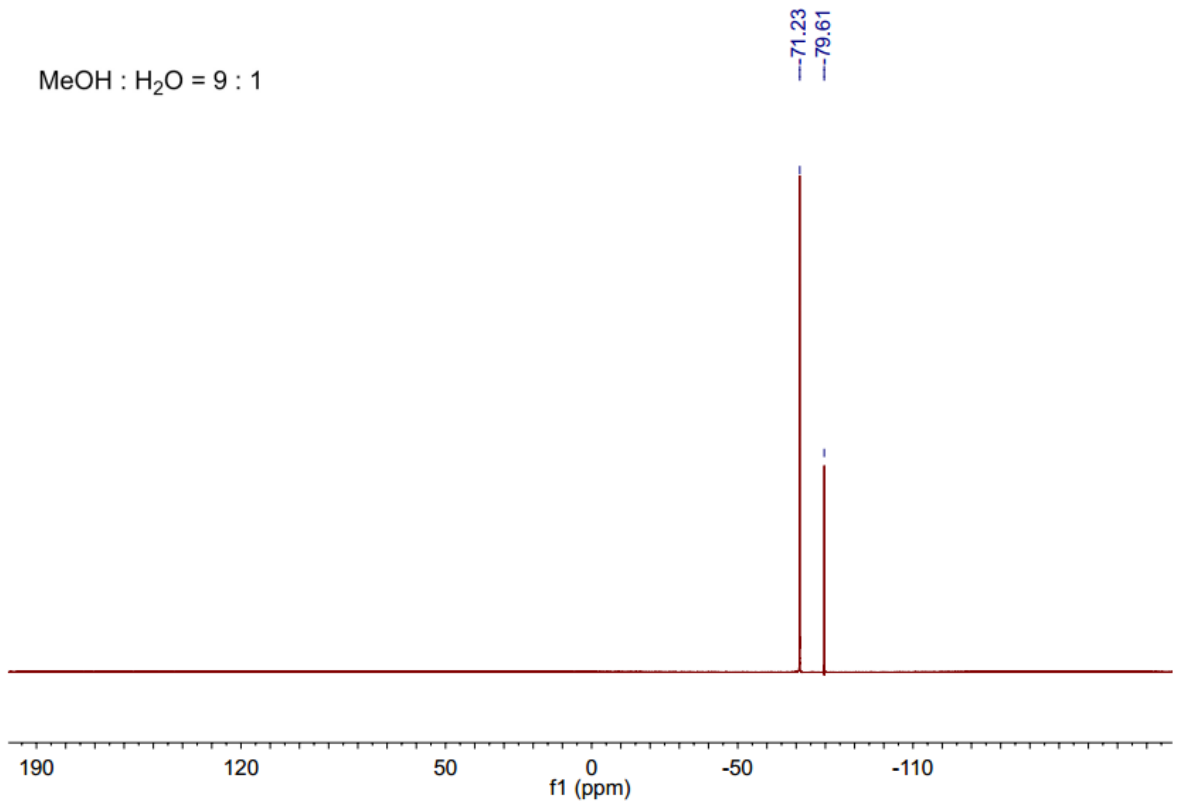


Compound **2b**, HRMS (ESI)

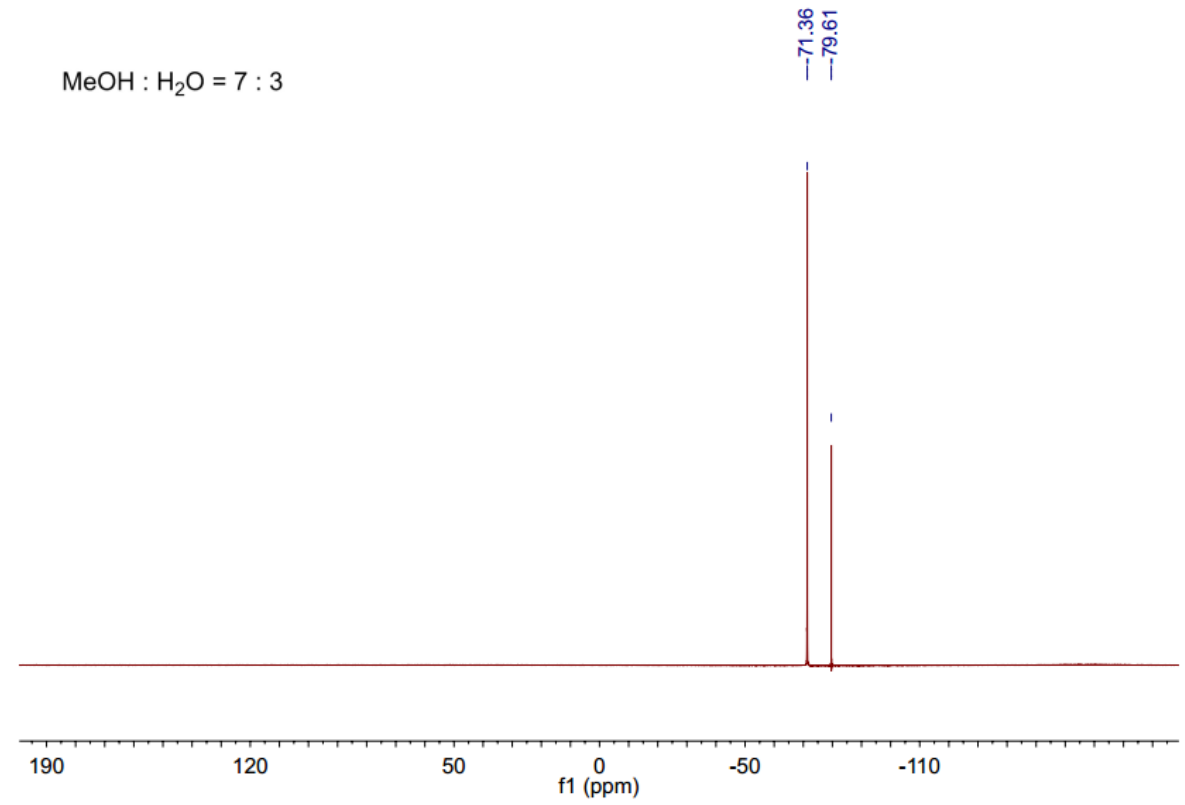


## 6. Copies of solvent-dependent (17.36 mM, 25 °C) $^{19}$F NMR spectra of compounds 1b

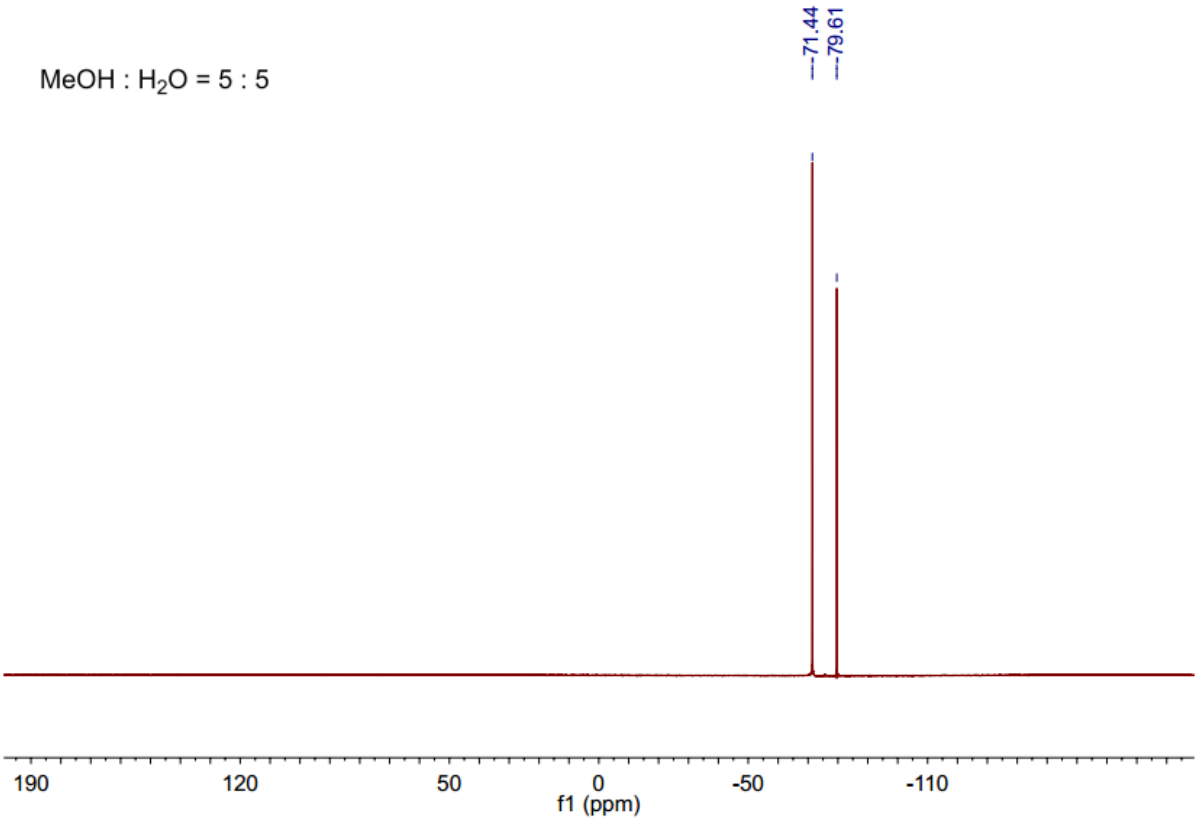


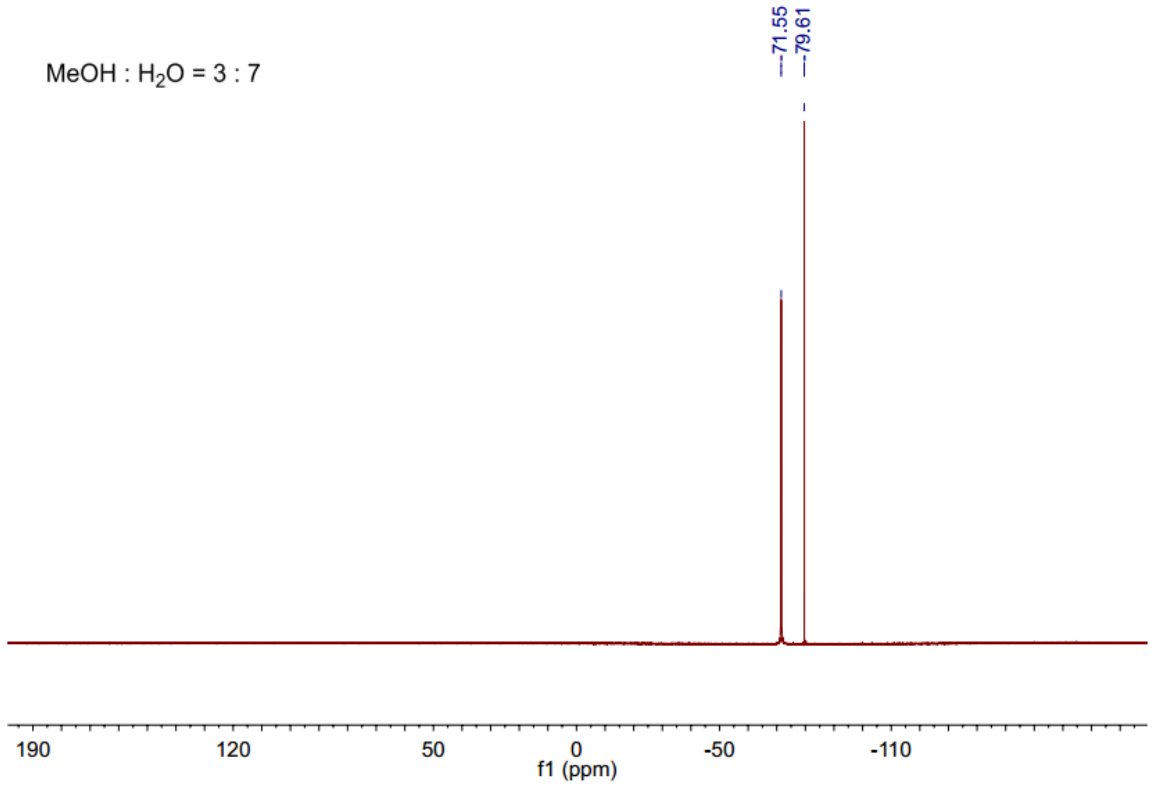
MeOH : $H_2O$ = 7 : 3



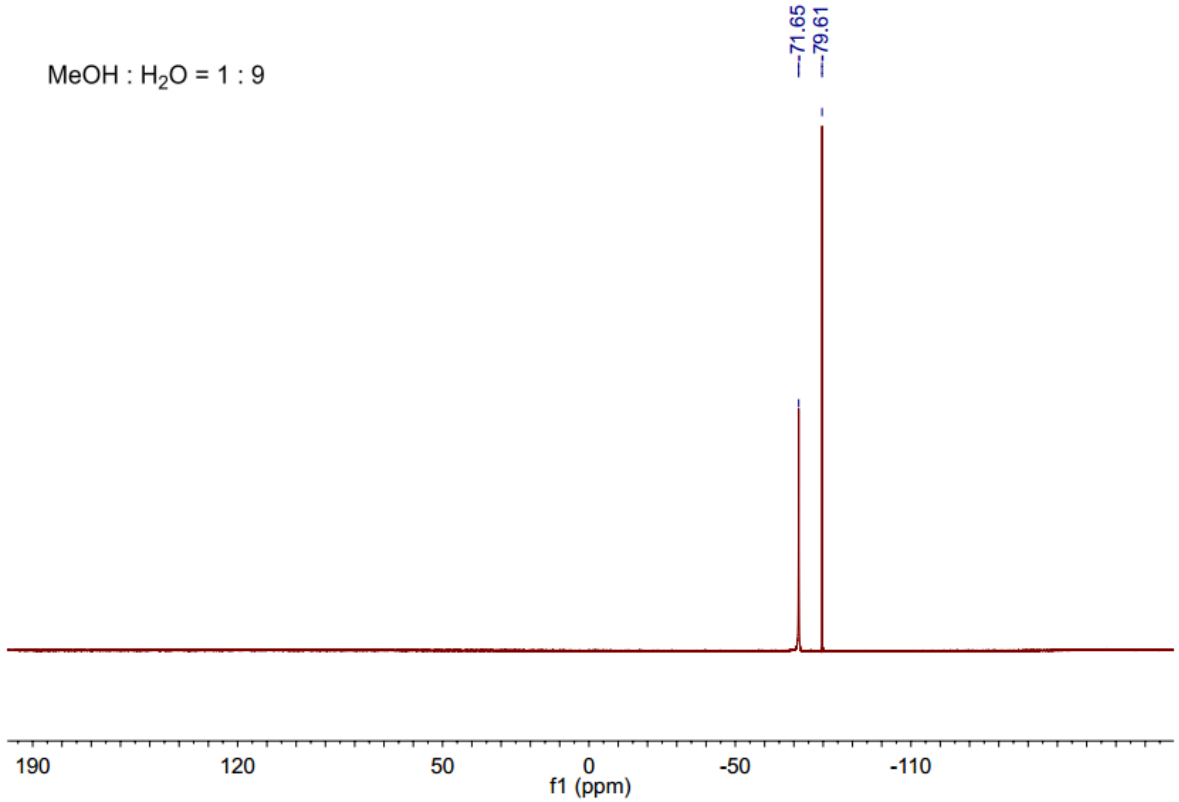

MeOH : $H_2O$ = 5 : 5



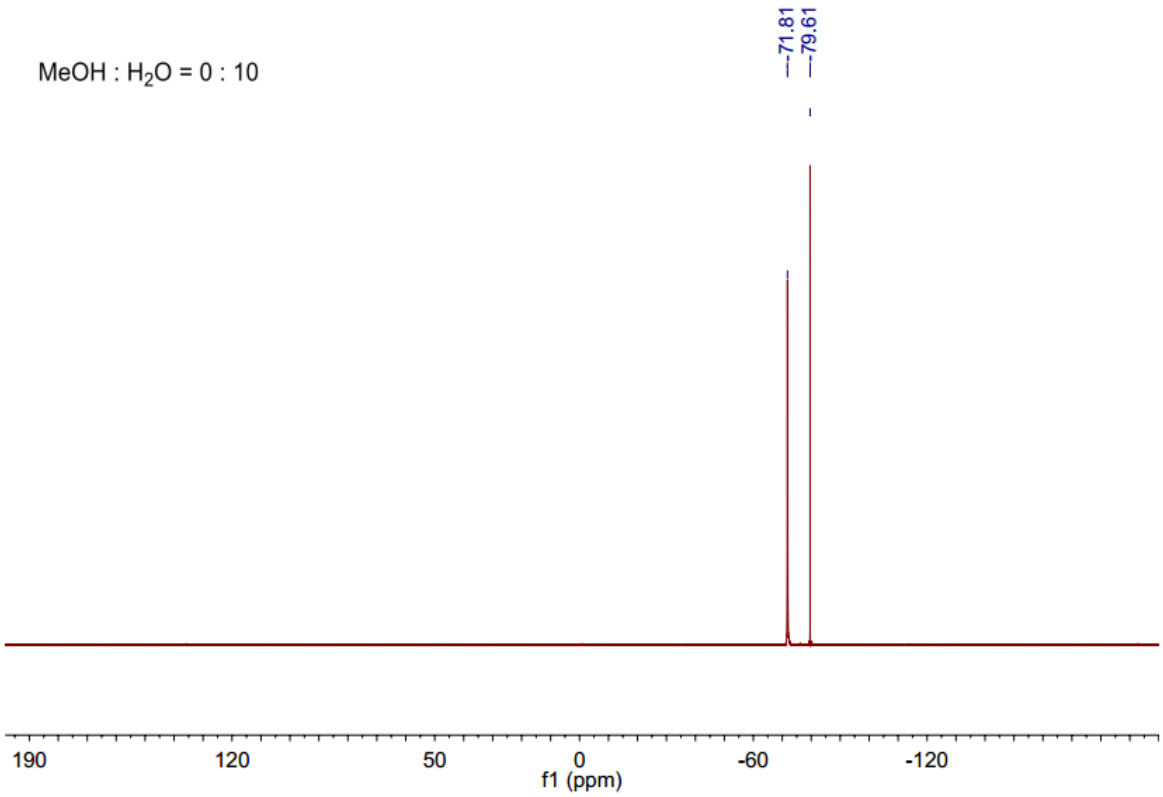
MeOH : $H_2O$ = 3 : 7



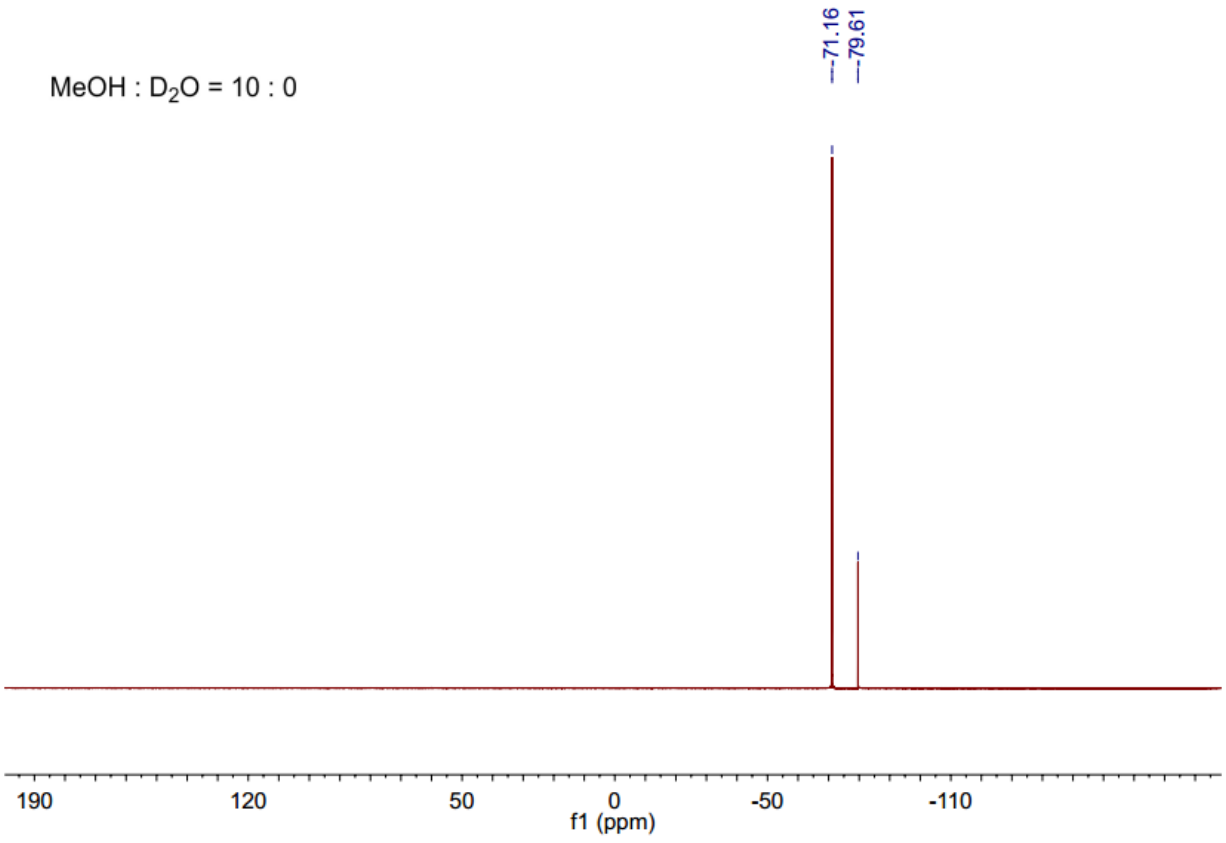

MeOH : $H_2O$ = 1 : 9



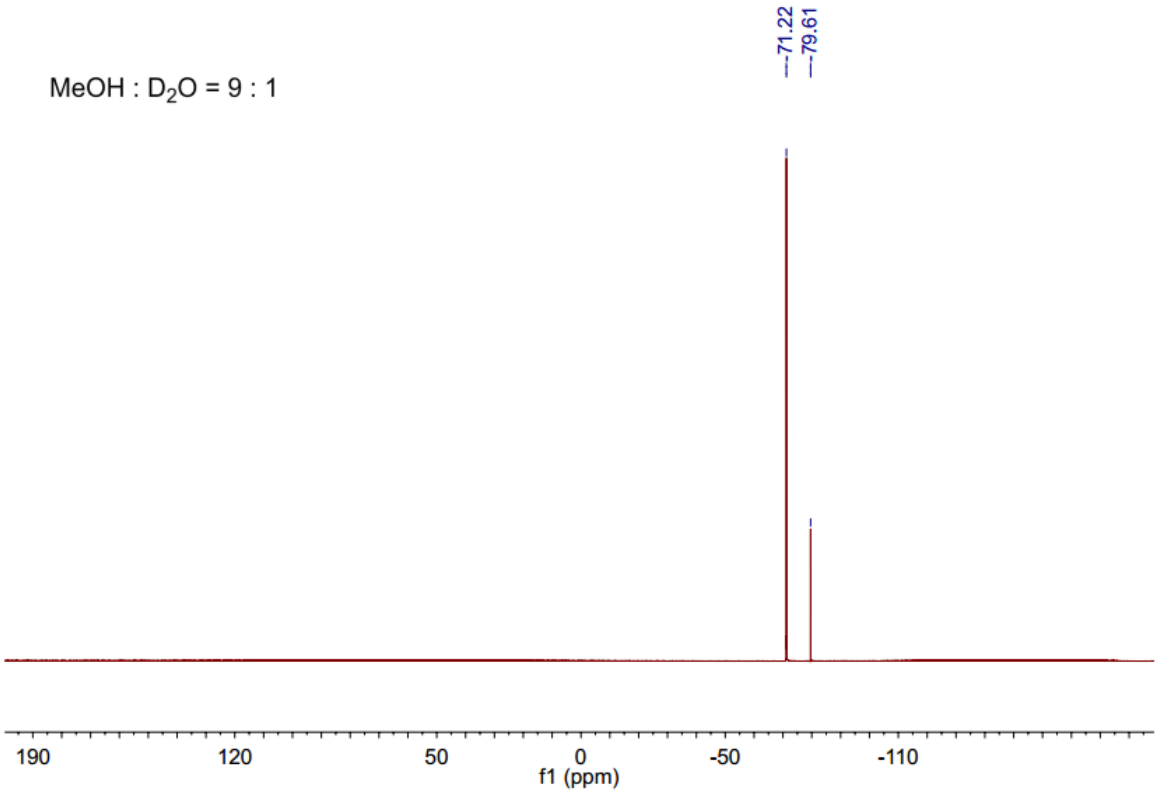
MeOH : $H_2O$ = 0 : 10



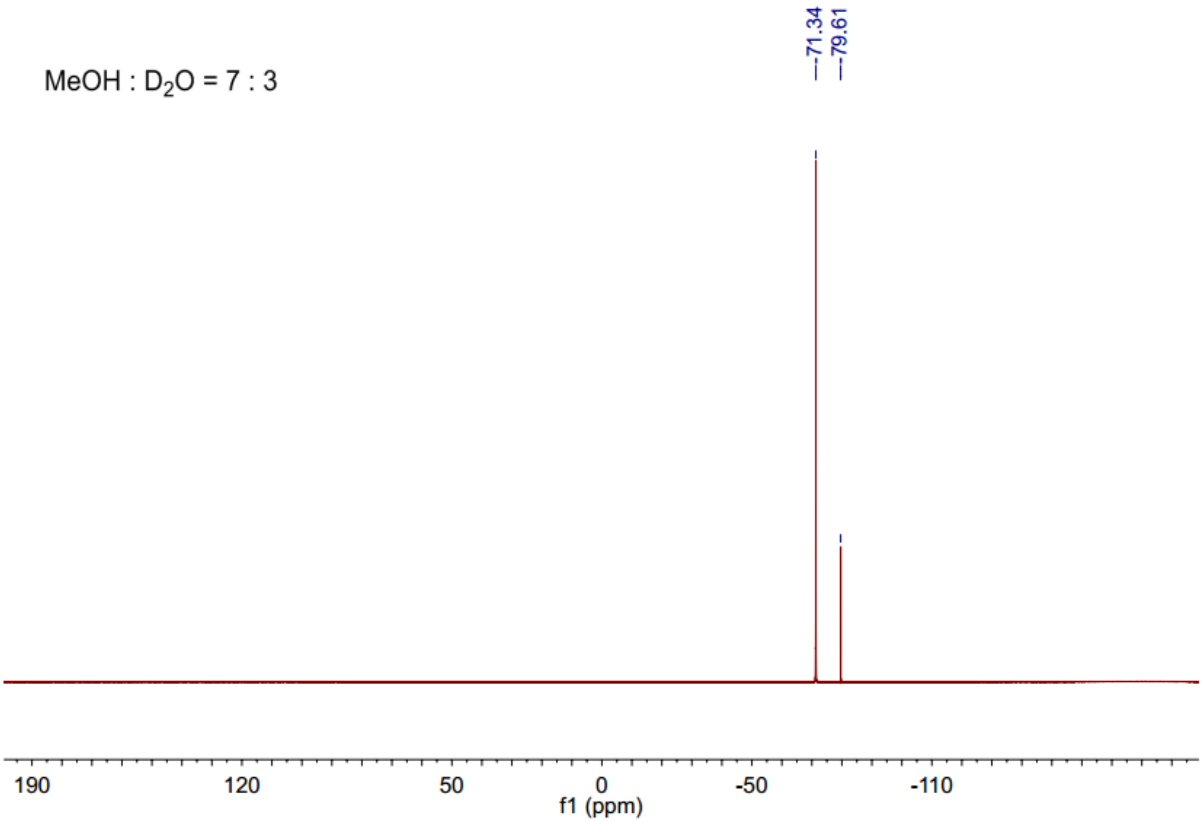

MeOH : $D_2O$ = 10 : 0



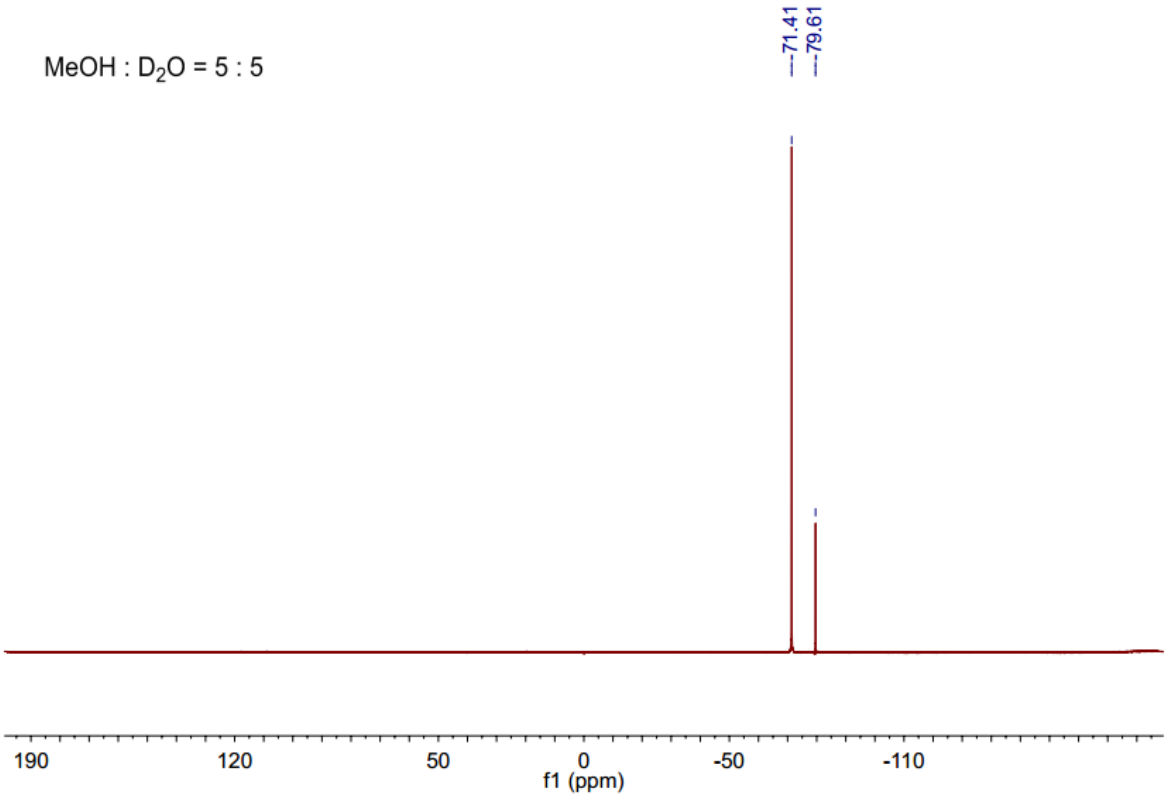
MeOH : $D_2O$ = 9 : 1



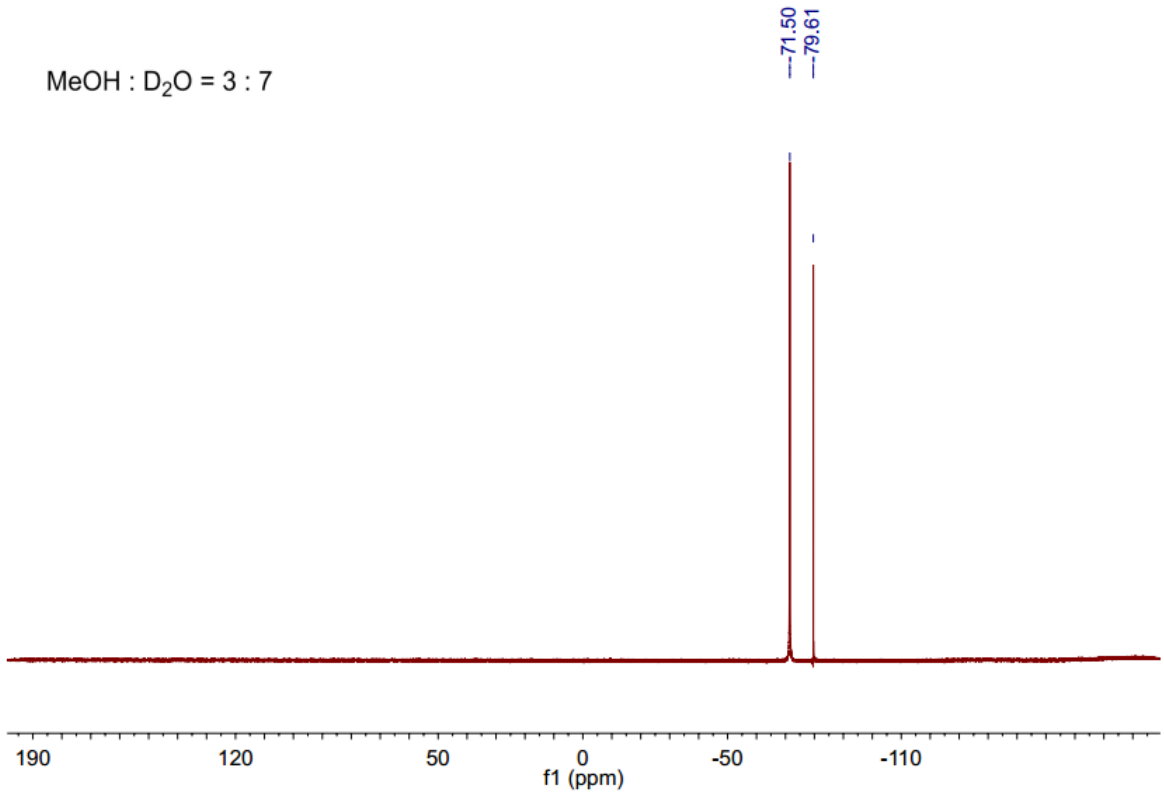

MeOH : $D_2O$ = 7 : 3

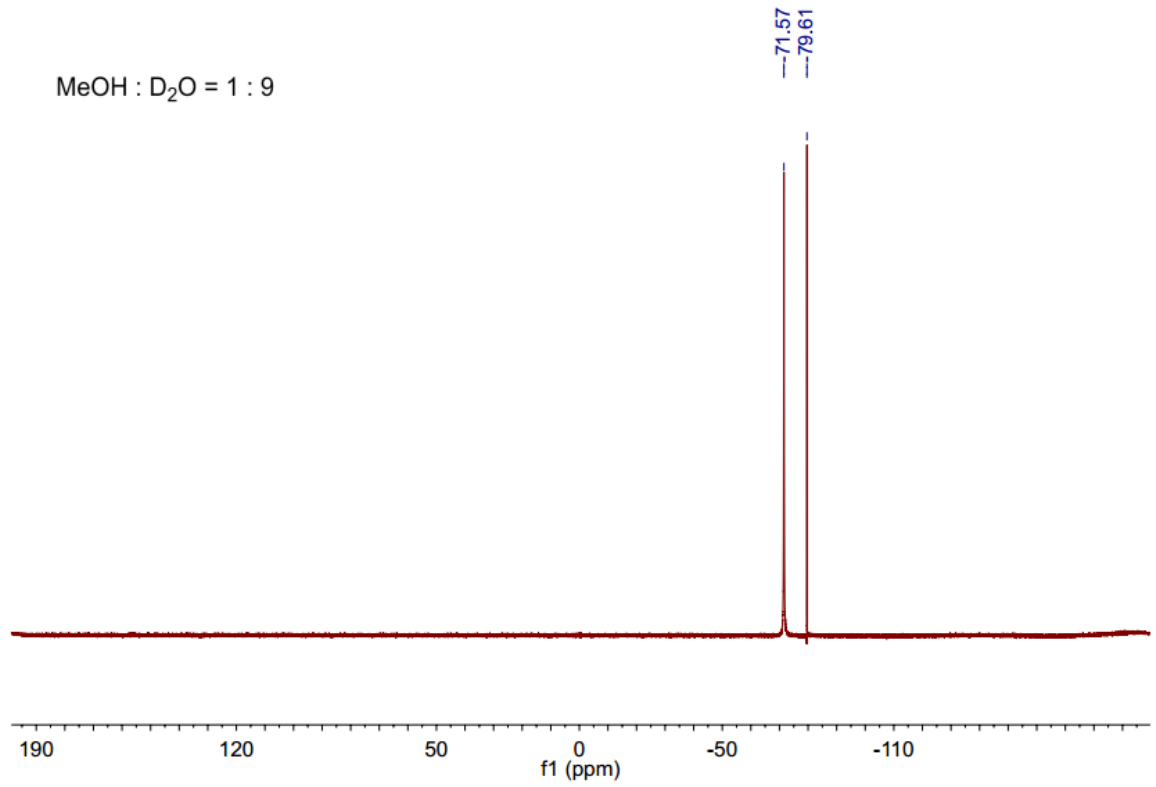


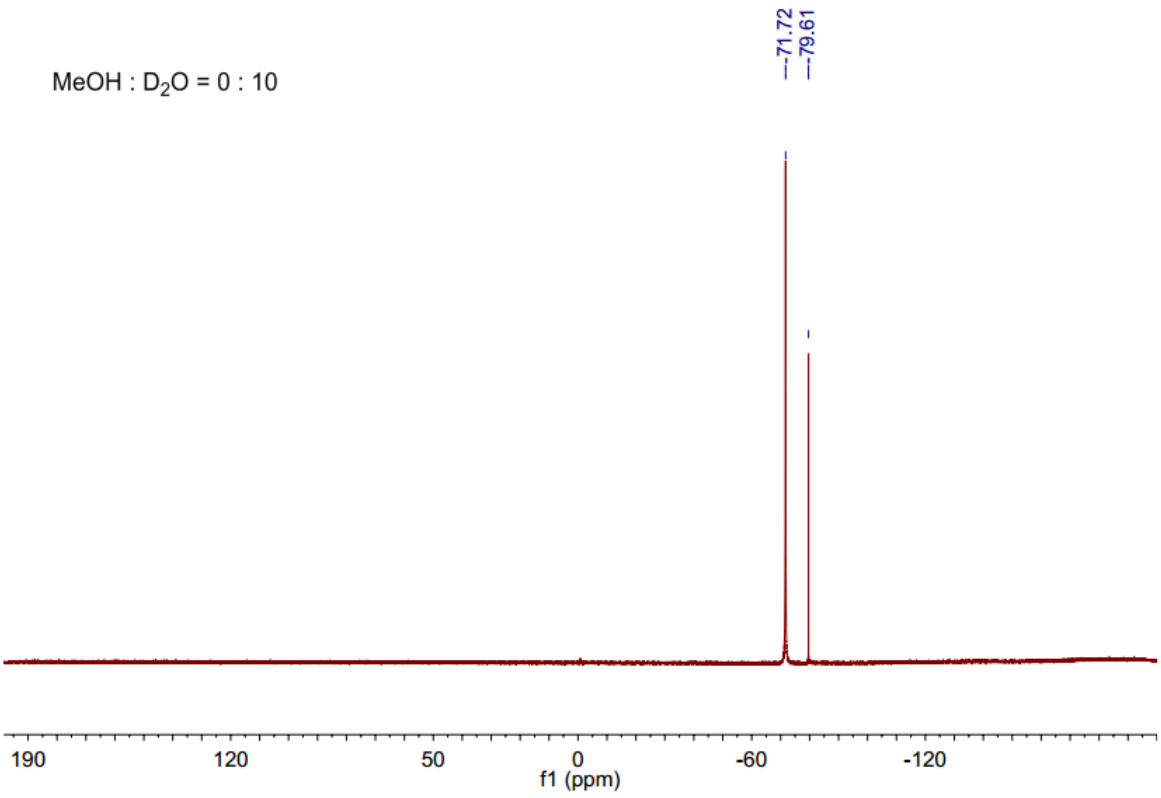
MeOH : $D_2O$ = 5 : 5



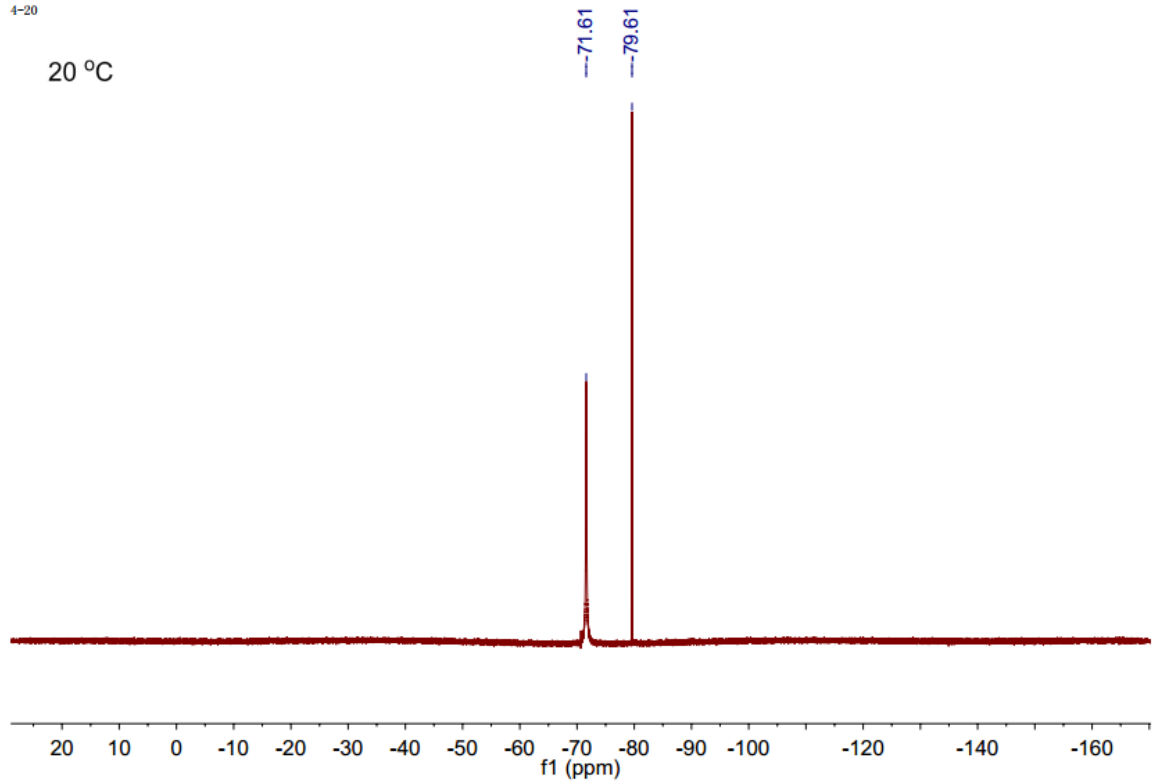

MeOH : $D_2O$ = 3 : 7

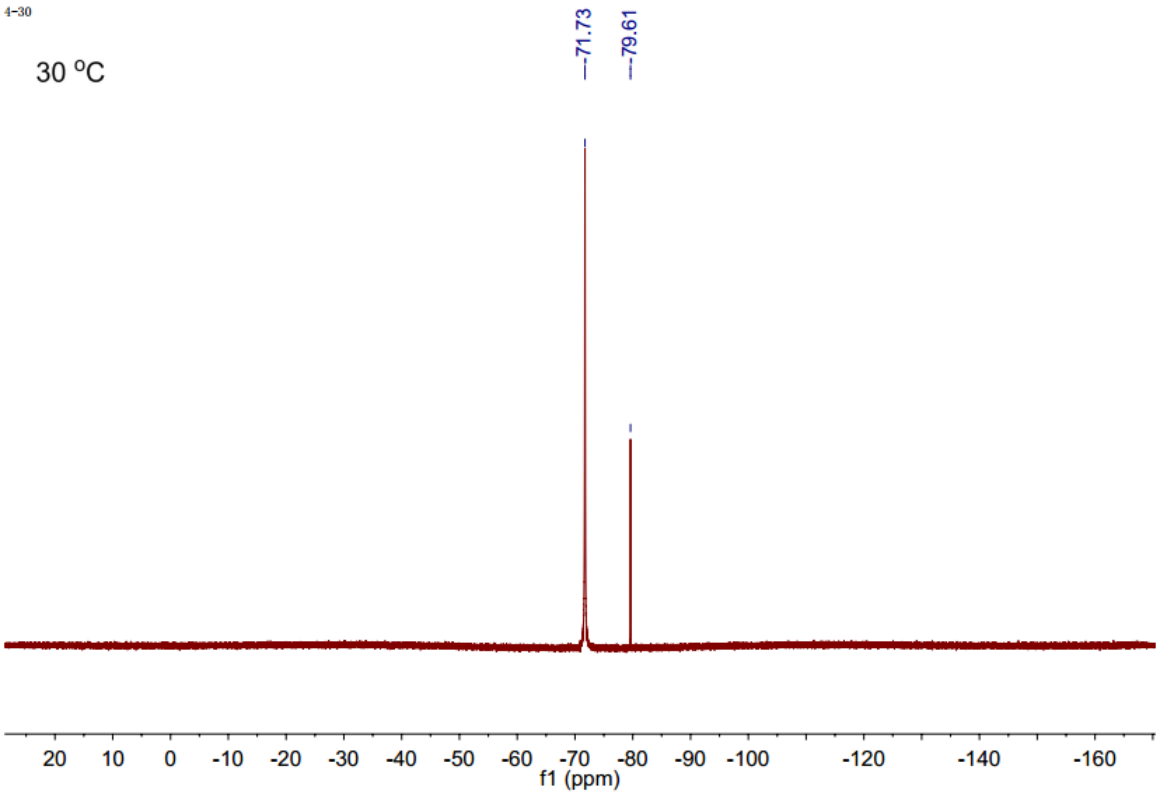


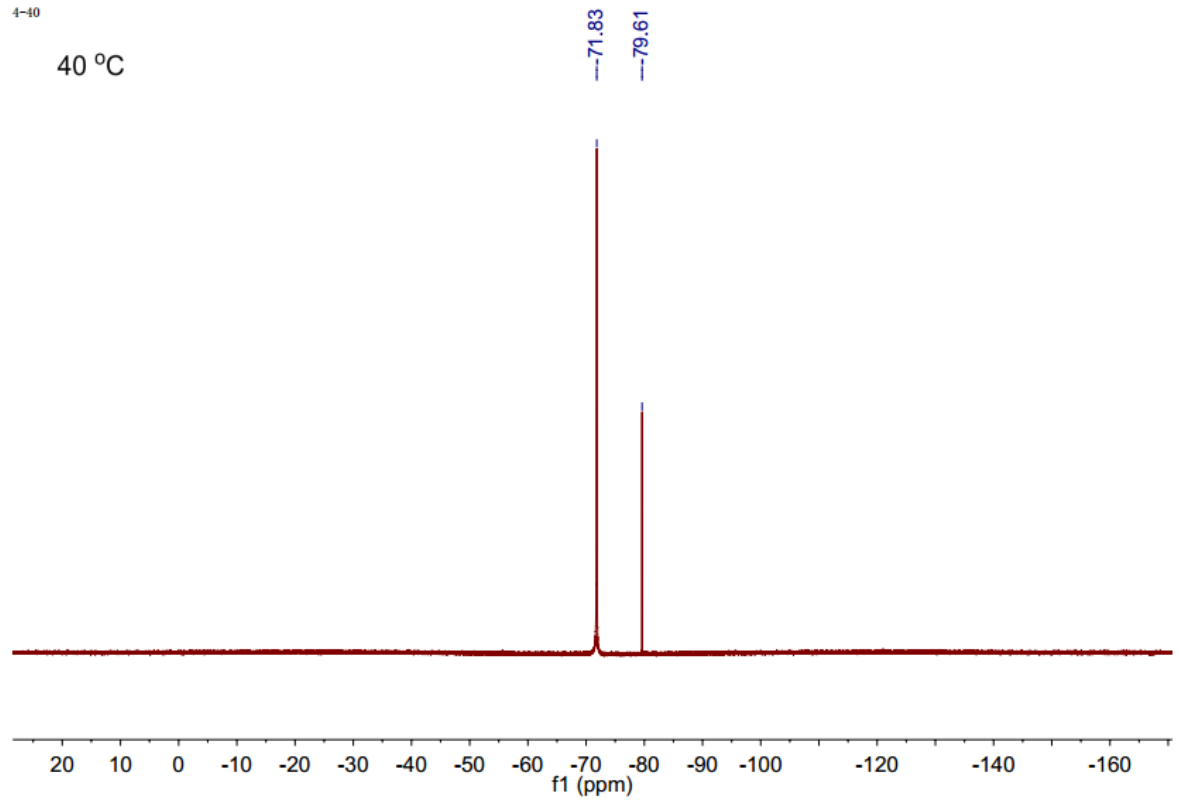

MeOH : D2O = 1 : 9
71.57
79.61
190
120
50
0
-50
-110
f1 (ppm)

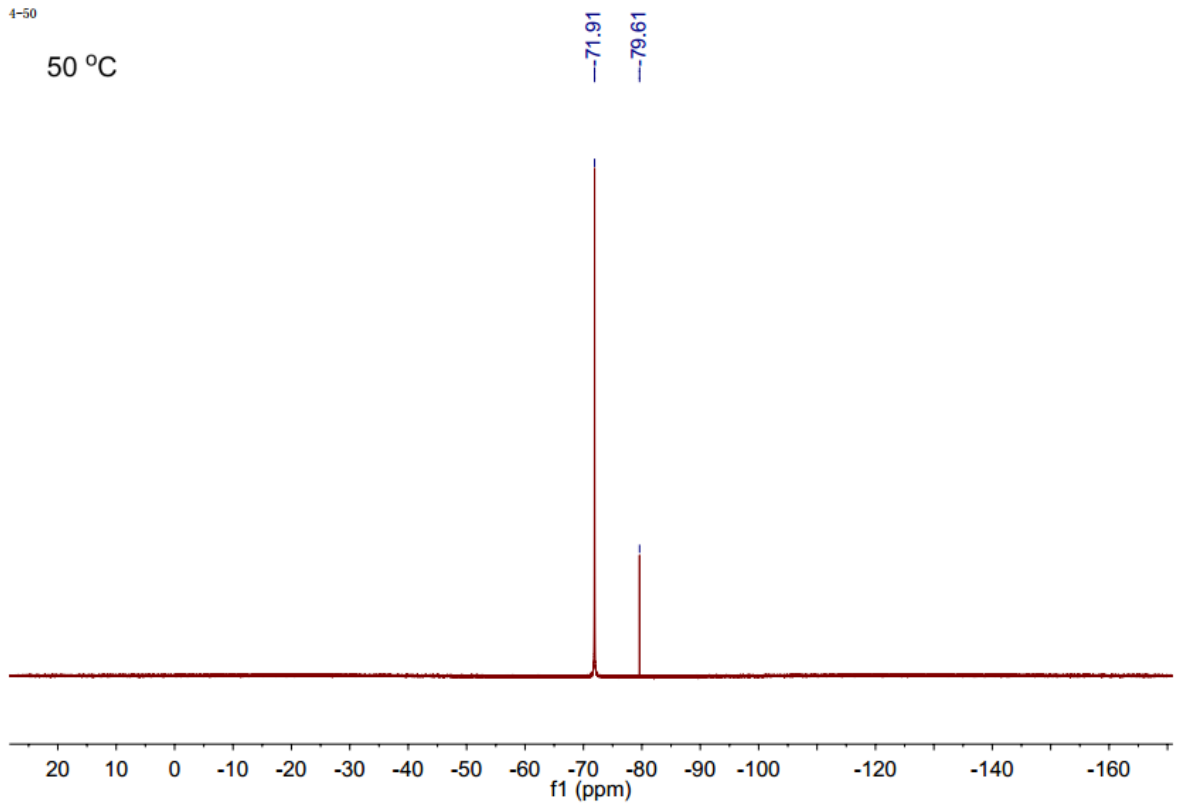

MeOH : D2O = 0 : 10
71.72
79.61
190
120
50
0
-60
-120
f1 (ppm)

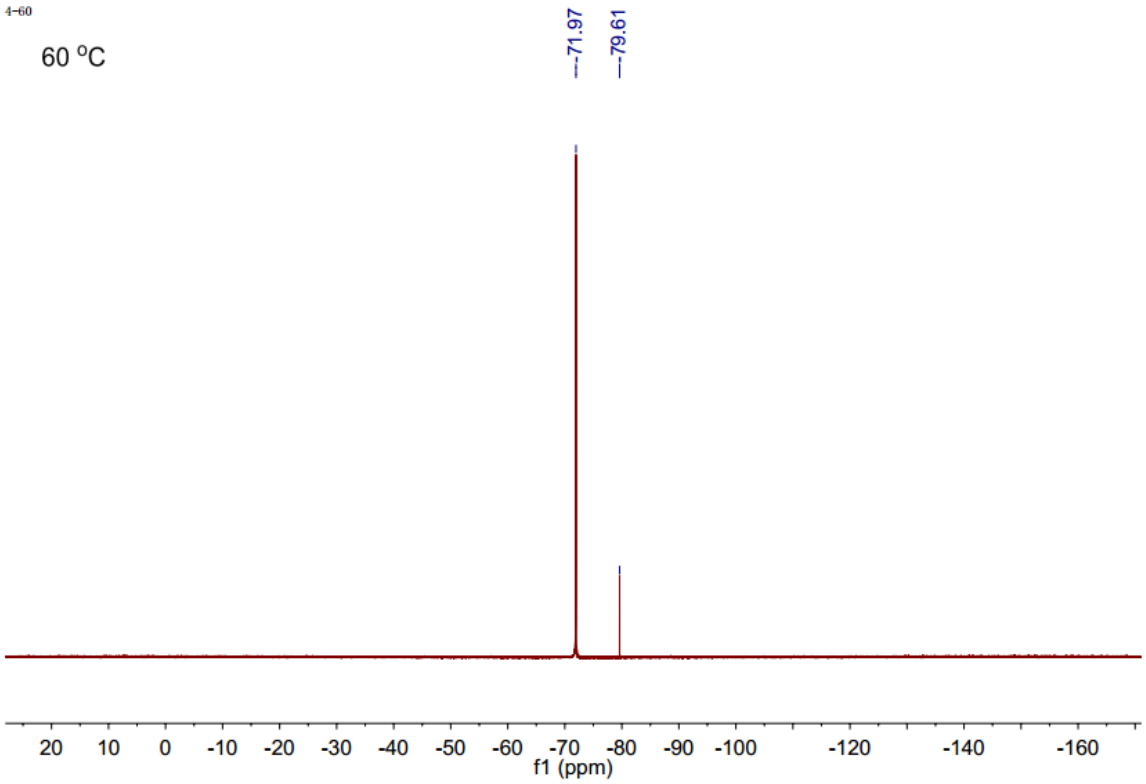
## 7. Copies of temperature-dependent (8.68 mM, in $D_2O$) $^{19}F$ NMR spectra of compounds 1b



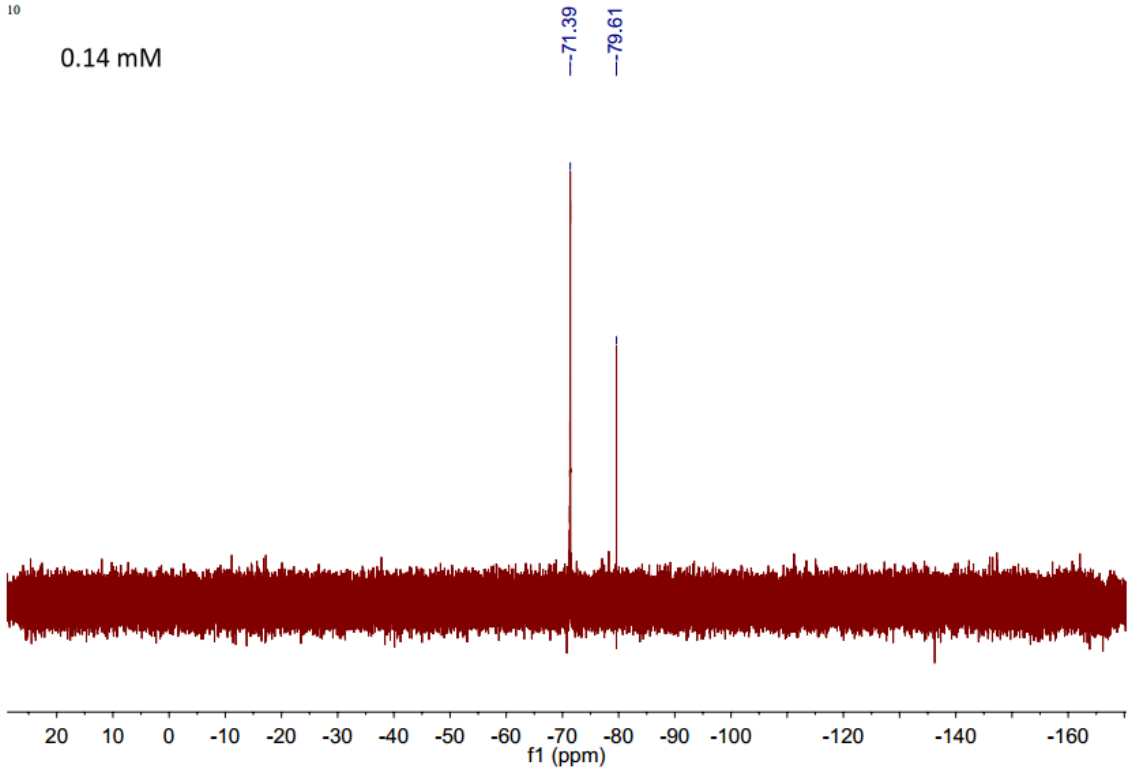



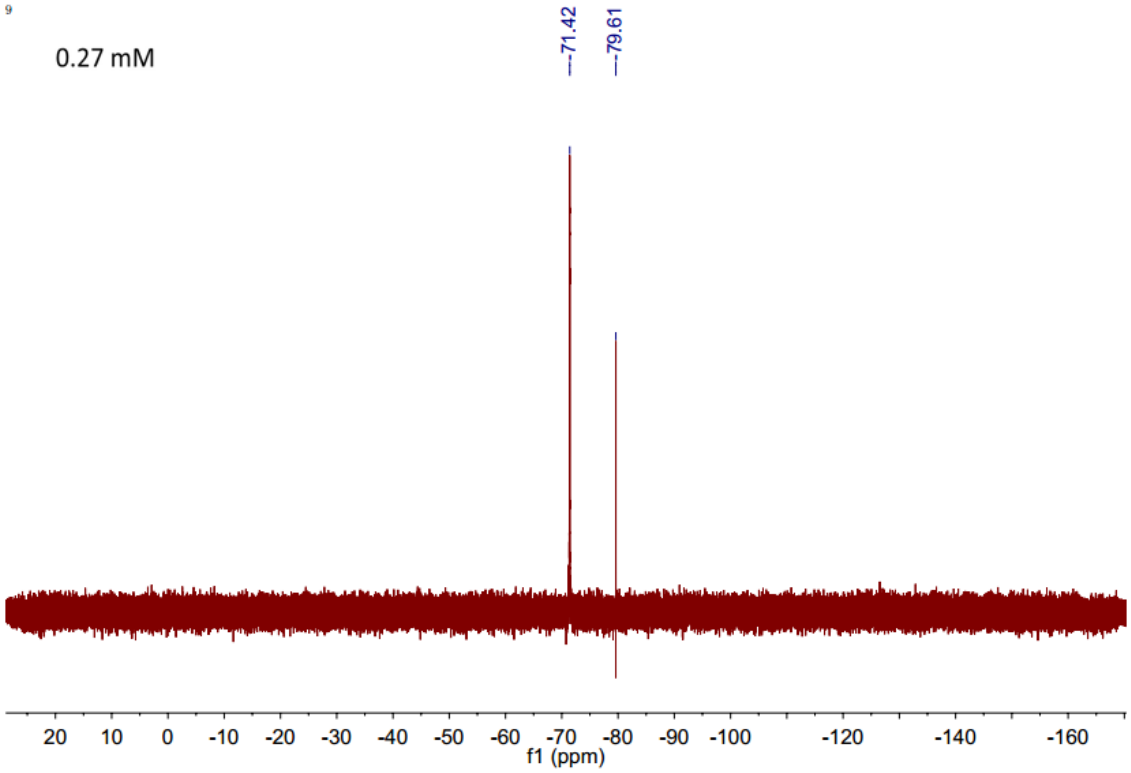

4-40
40 °C
-71.83
-79.61
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -120 -140 -160
f1 (ppm)

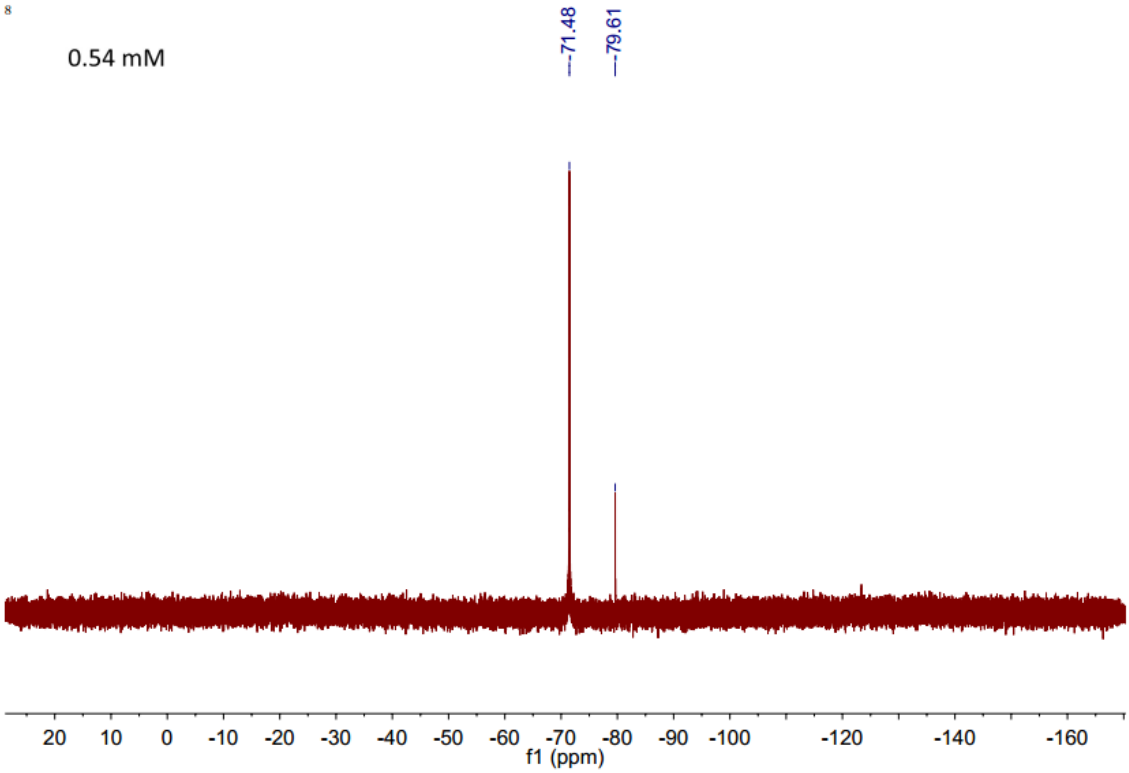

4-50
50 °C
-71.91
-79.61
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -120 -140 -160
f1 (ppm)

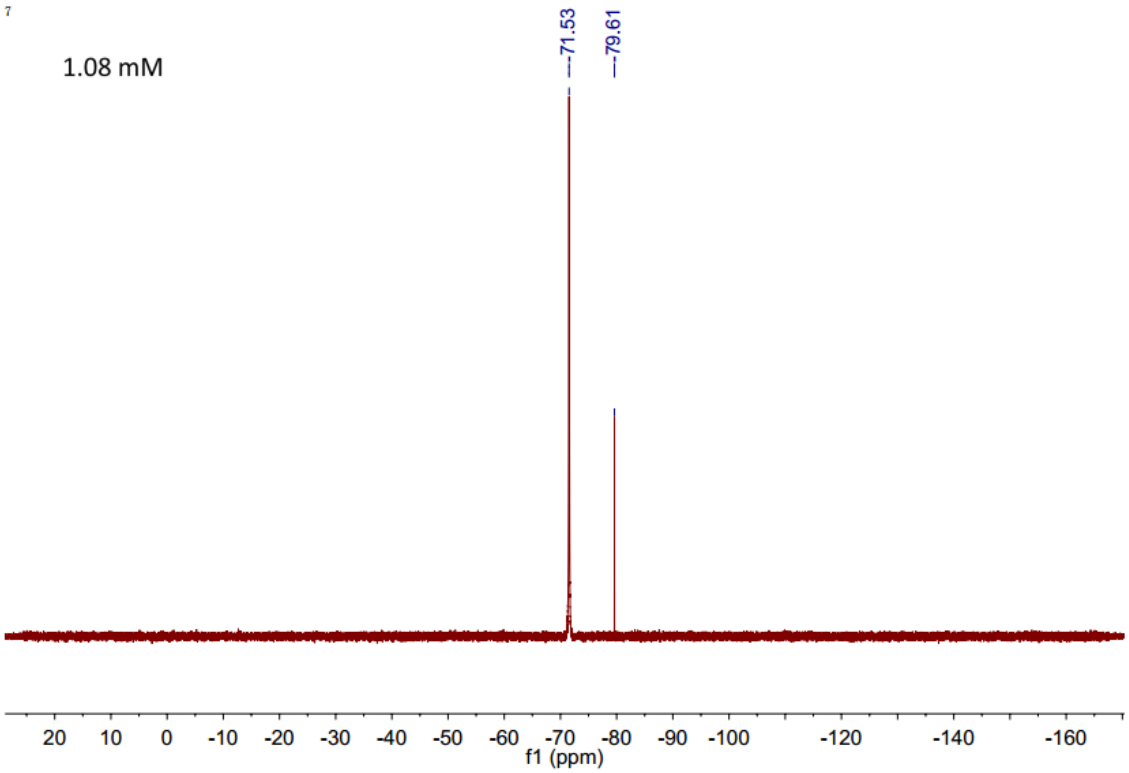

4-60
60 °C
-71.97
-79.61
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-120
-140
-160
f1 (ppm)

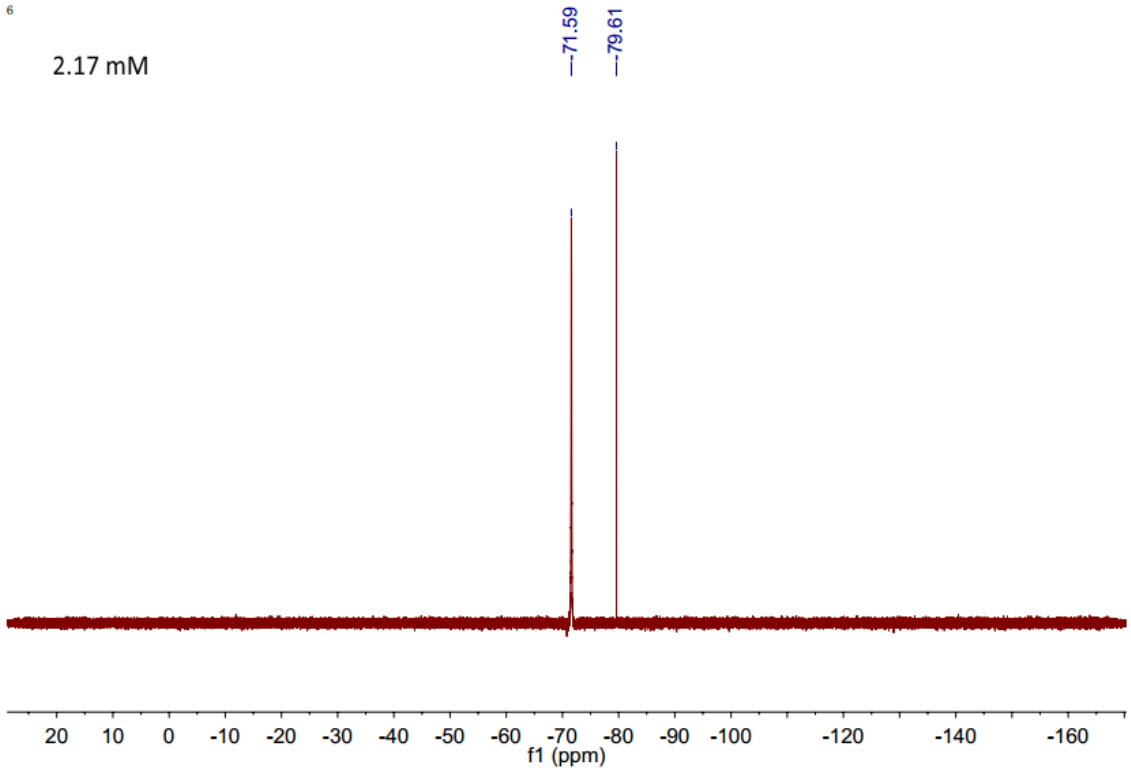
## 8. Copies of concentration-dependent (25 °C, in $D_2O$) $^{19}F$ NMR spectra of compounds 1b

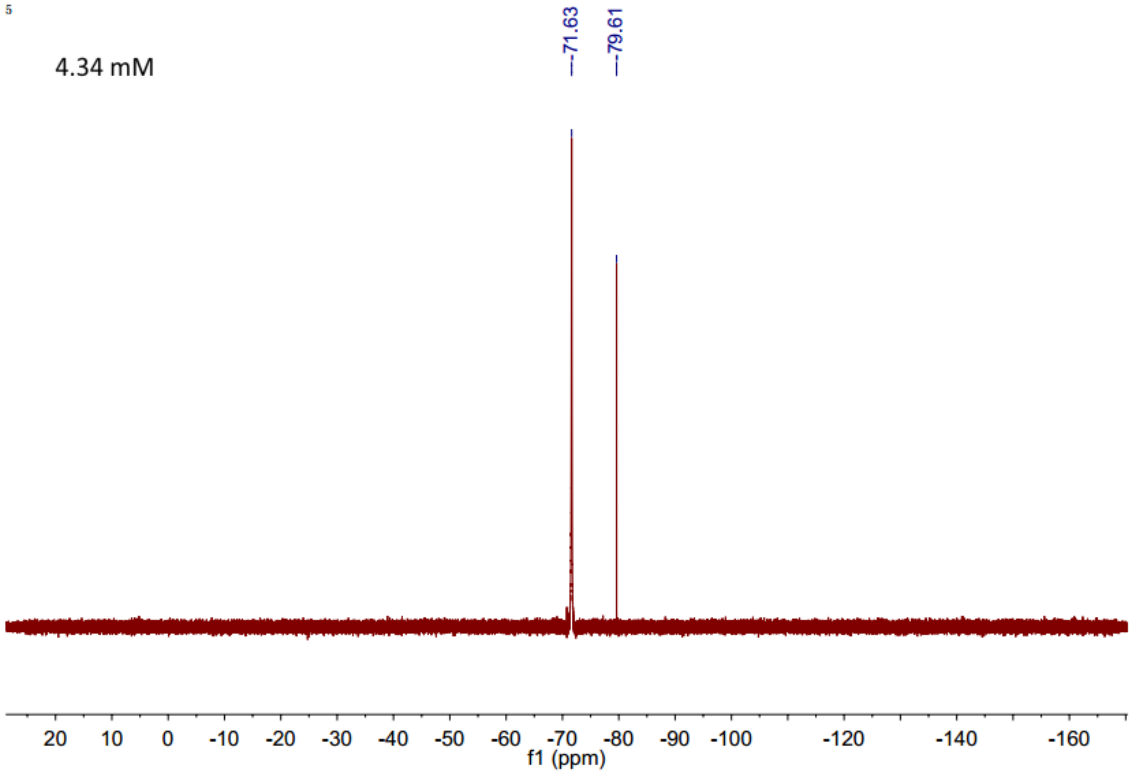


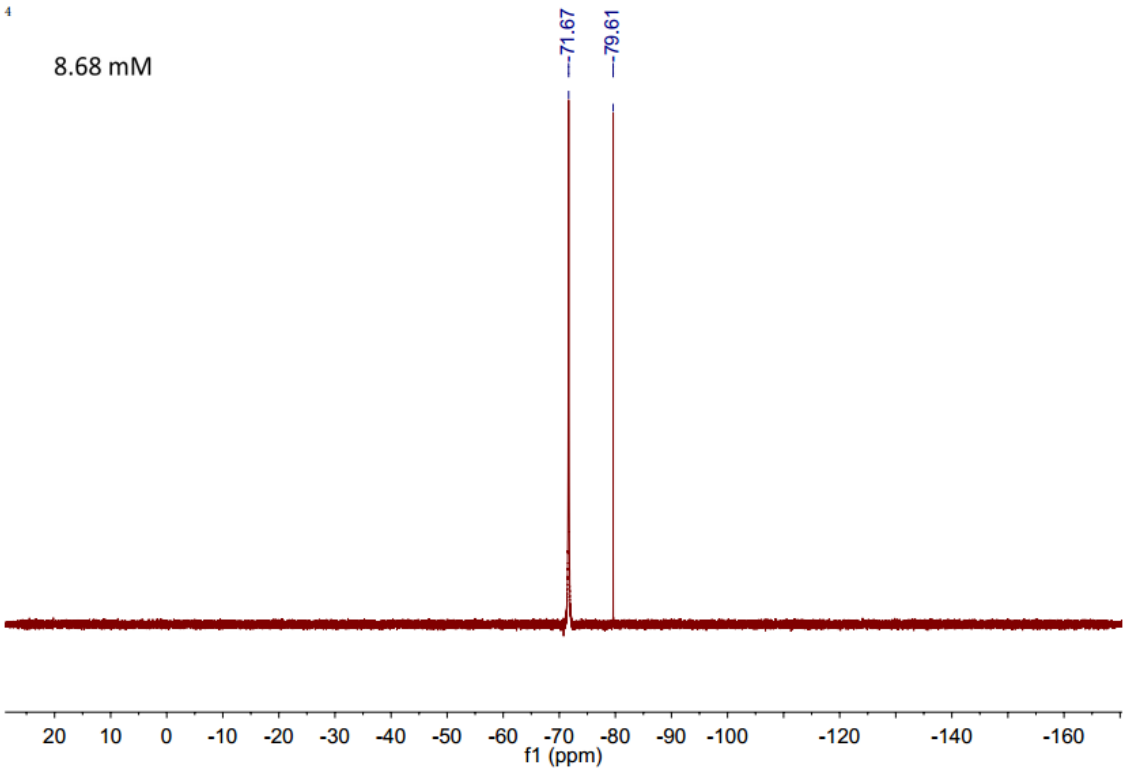



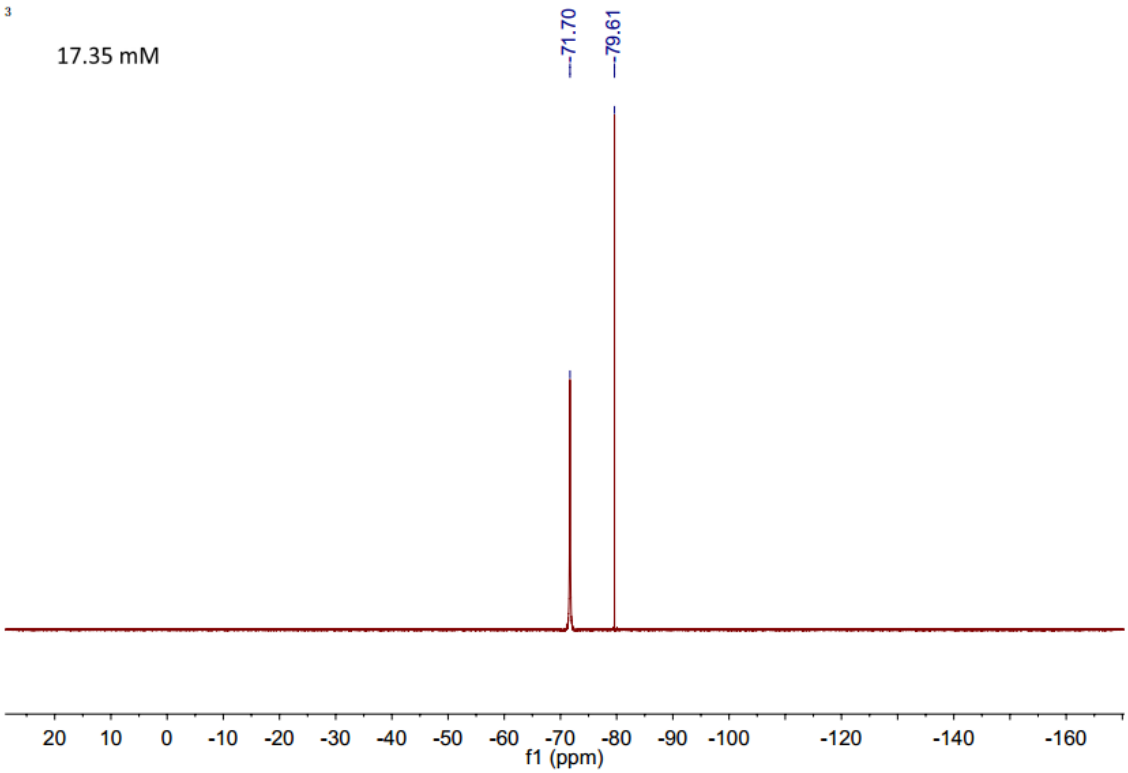

8
0.54 mM
71.48
79.61
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -120 -140 -160
f1 (ppm)

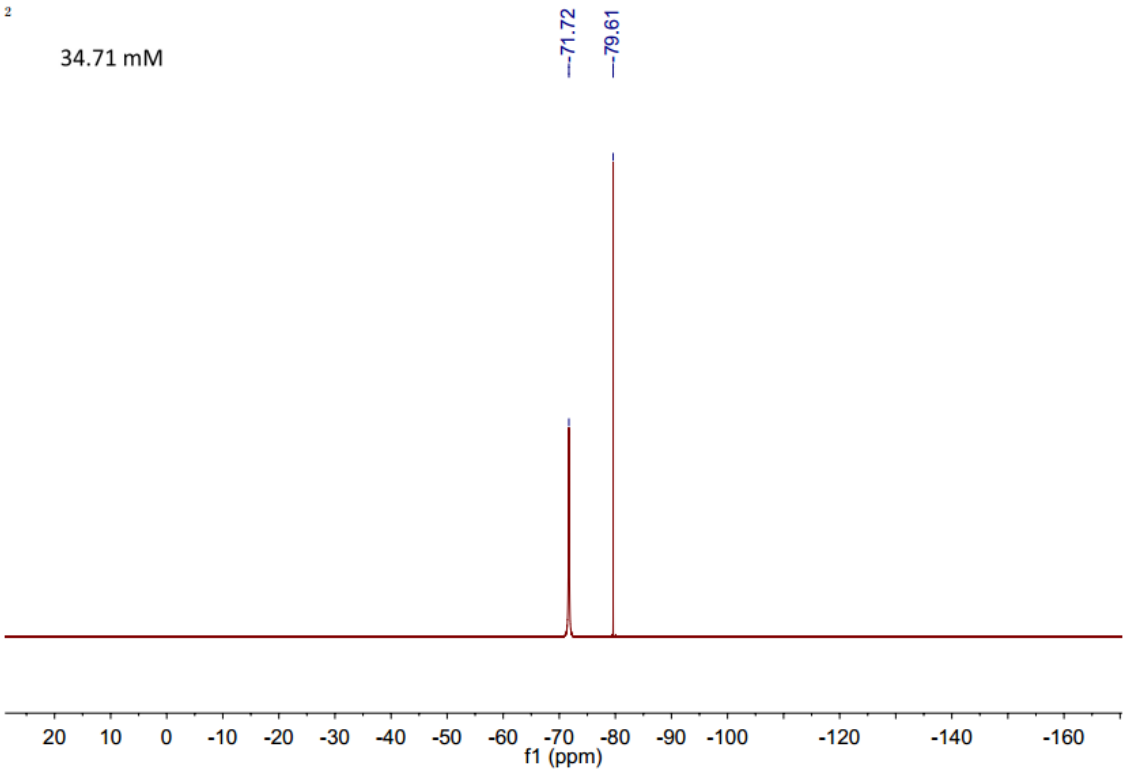

7
1.08 mM
71.53
79.61
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -120 -140 -160
f1 (ppm)


6
2.17 mM
-71.59
-79.61
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -120 -140 -160
f1 (ppm)

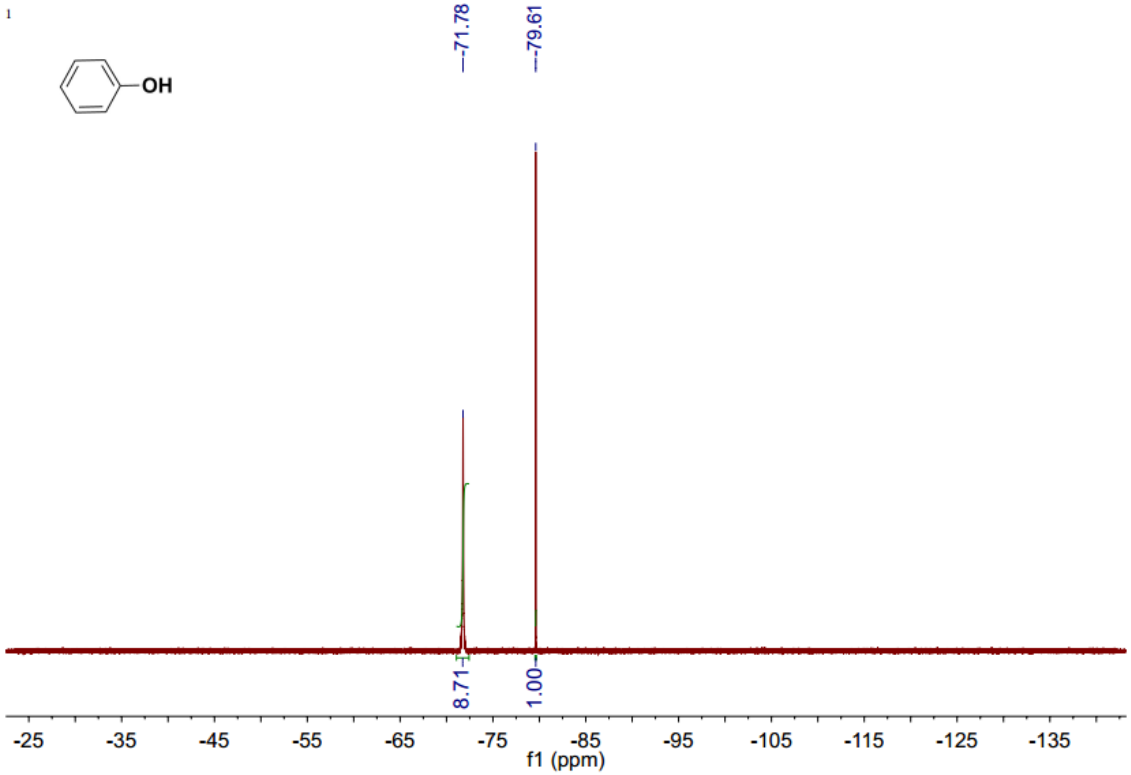

5
4.34 mM
-71.63
-79.61
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -120 -140 -160
f1 (ppm)

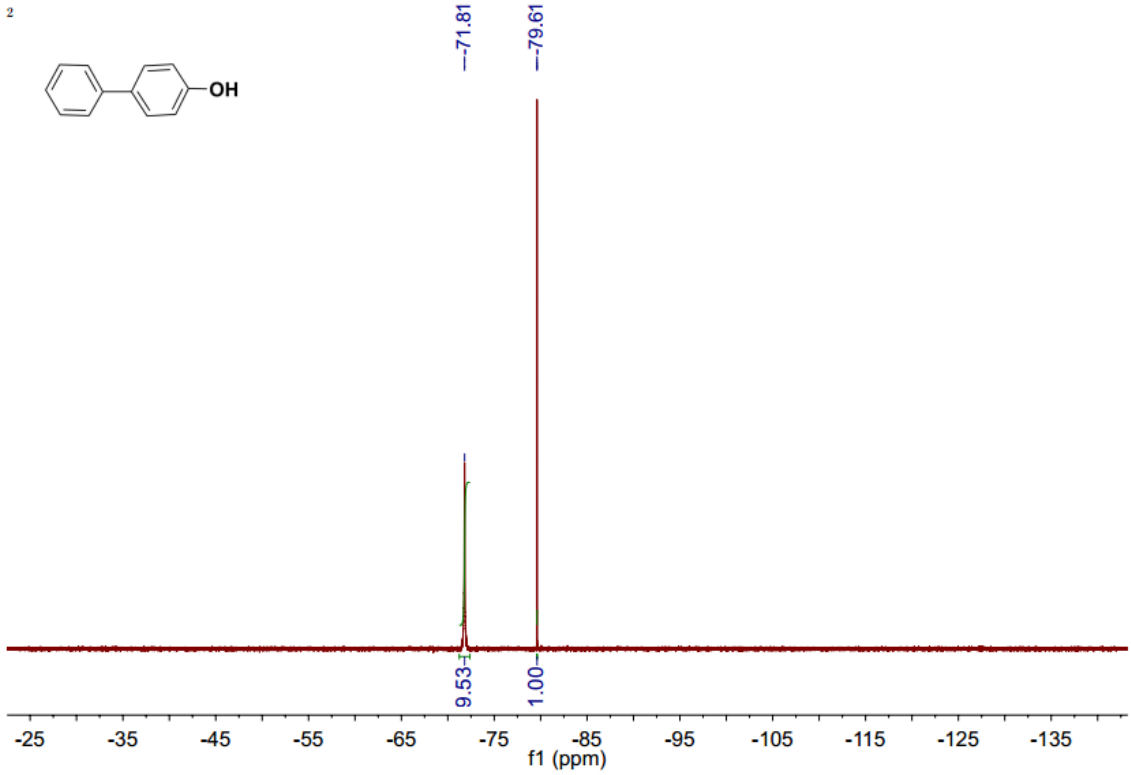

4
8.68 mM
-71.67
-79.61
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -120 -140 -160
f1 (ppm)


3
17.35 mM
-71.70
-79.61
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -120 -140 -160
f1 (ppm)

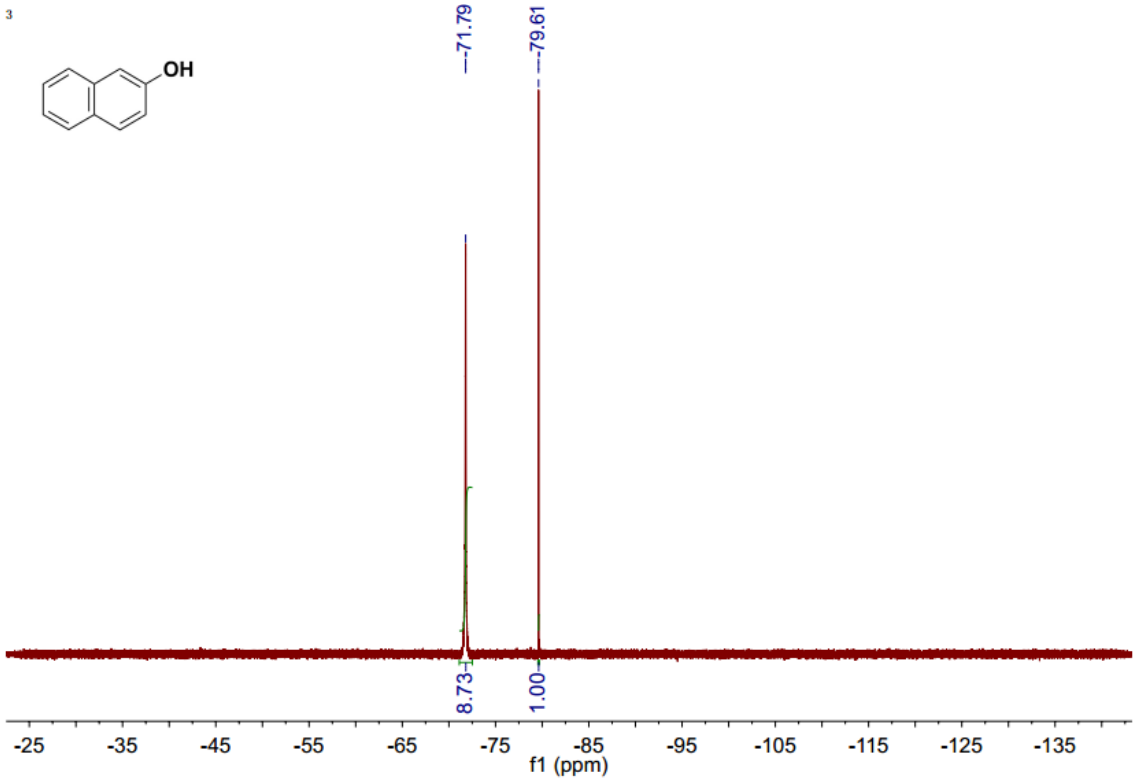

2
34.71 mM
-71.72
-79.61
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-120
-140
-160
f1 (ppm)

**9. Copies of additive-dependent (25 $^{o}$C, in $H_2O$) $^{19}$F NMR spectra of compounds 1b (8.68 mM for 1b and Eq 1.0 for additives)**

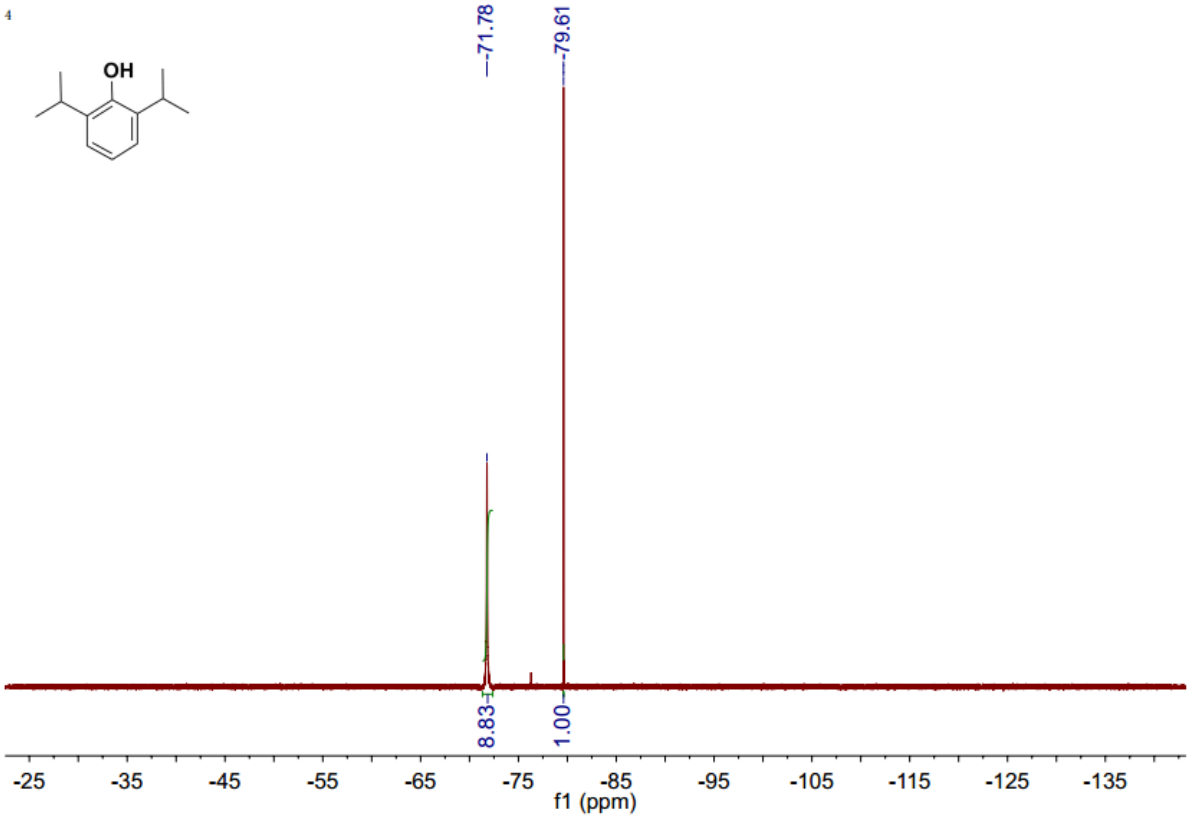


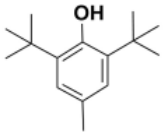
3


OH
-71.79
-79.61
8.73
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

4

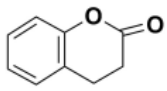

OH
-71.78
-79.61
8.83
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

5

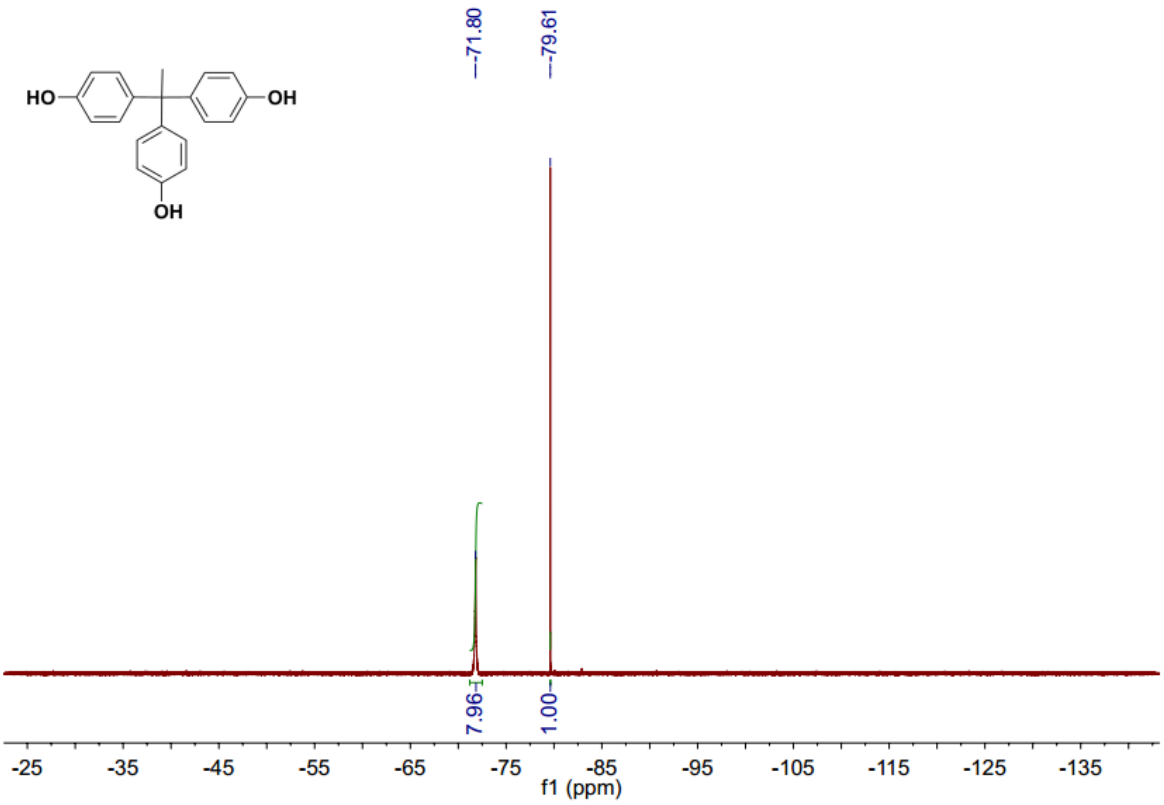

OH

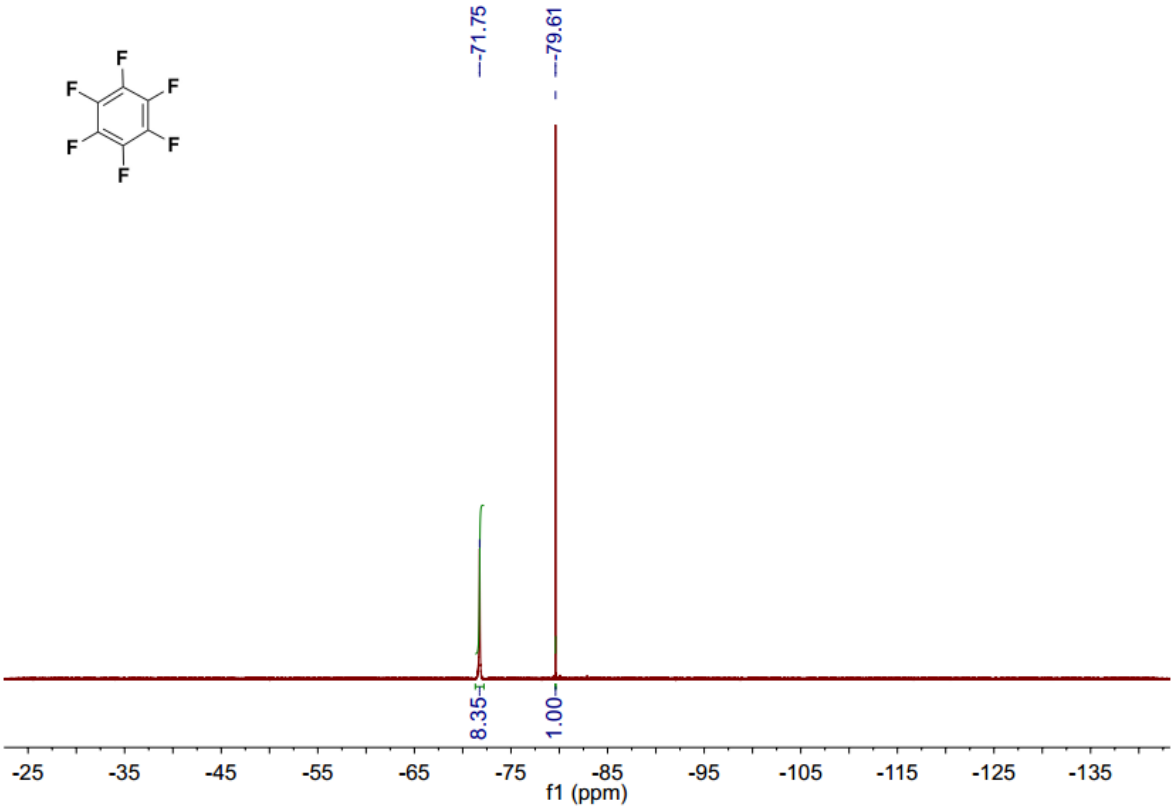

-71.75
-79.61
8.86
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

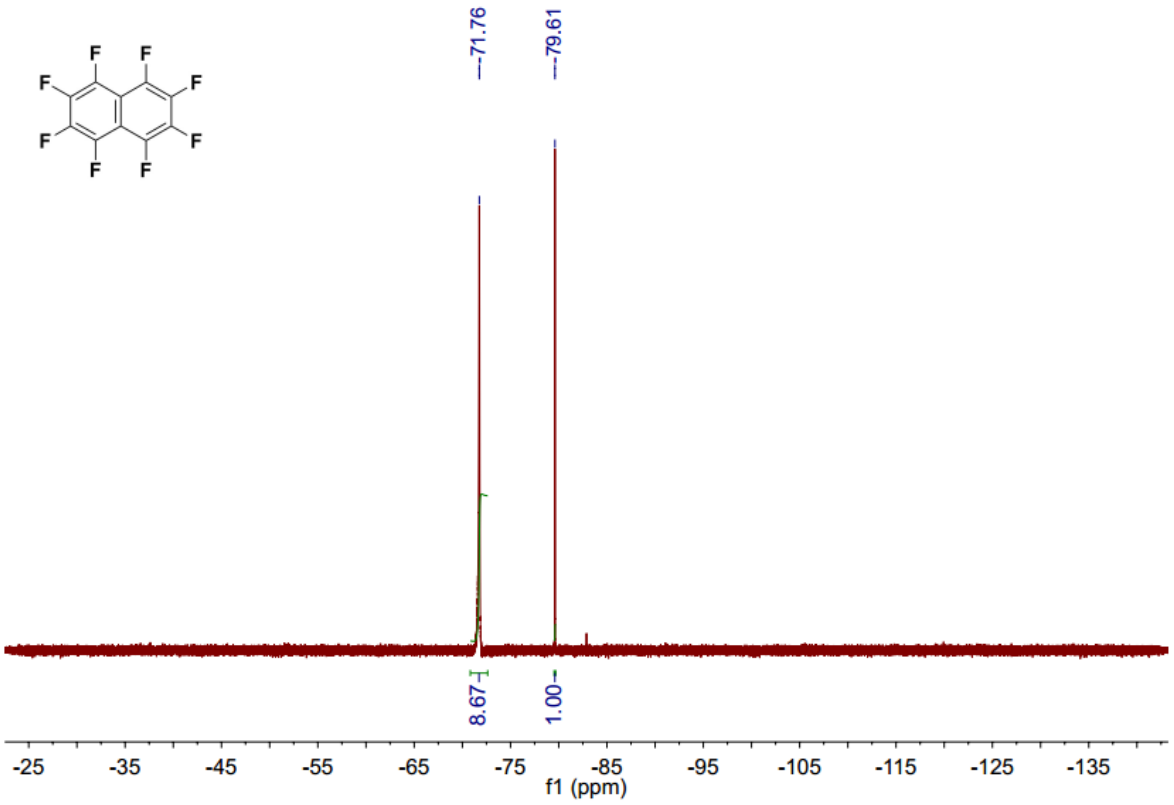
7

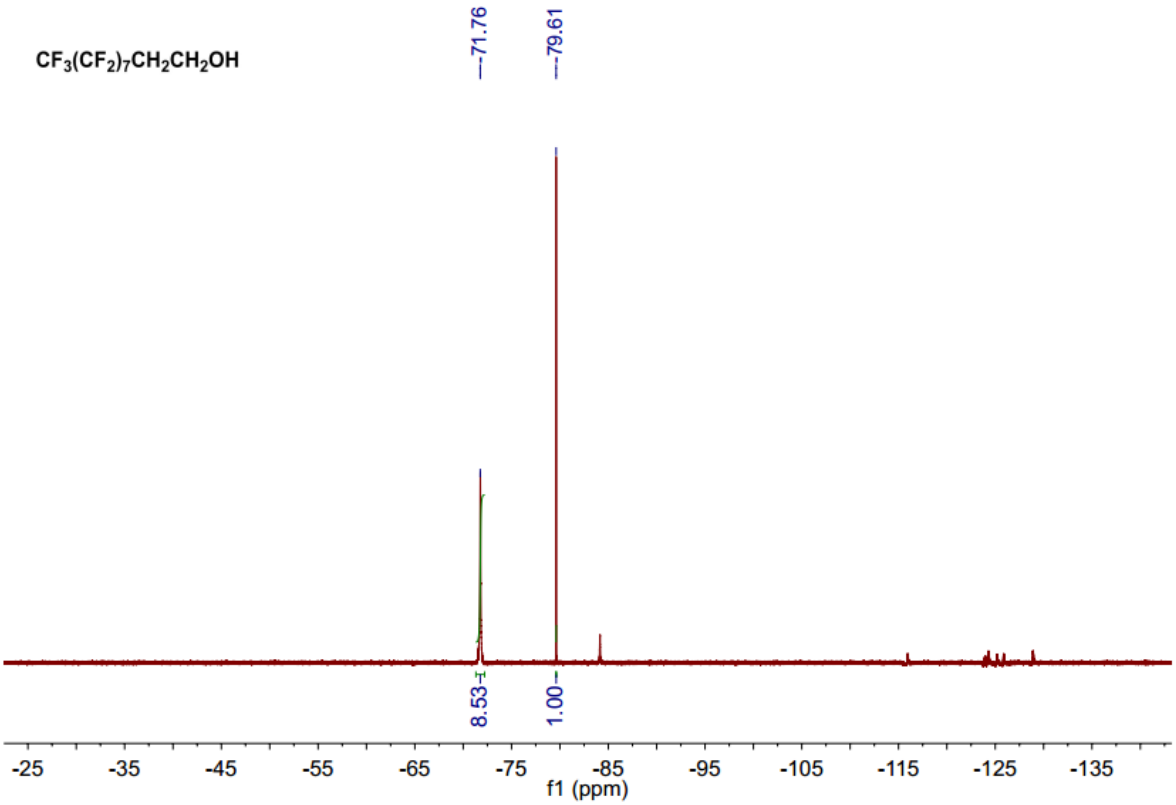

O
O

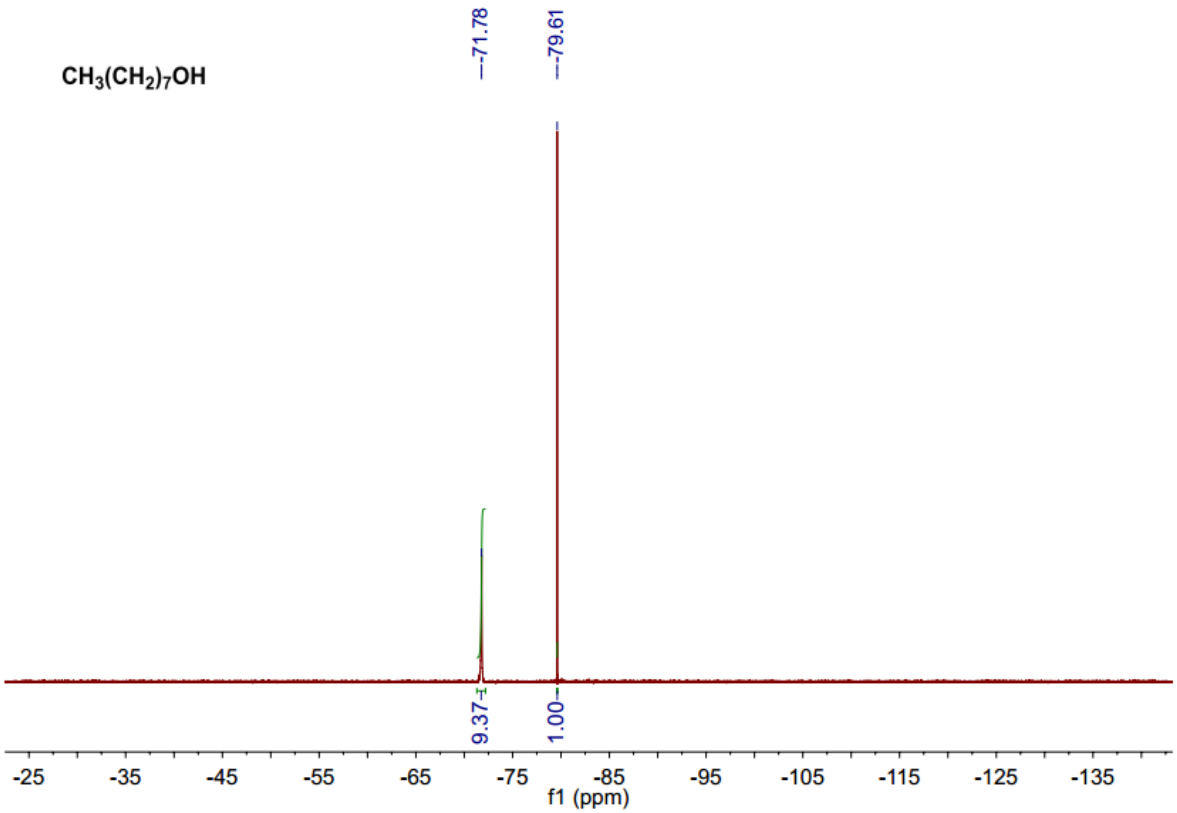

-71.76
-79.61
8.68
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

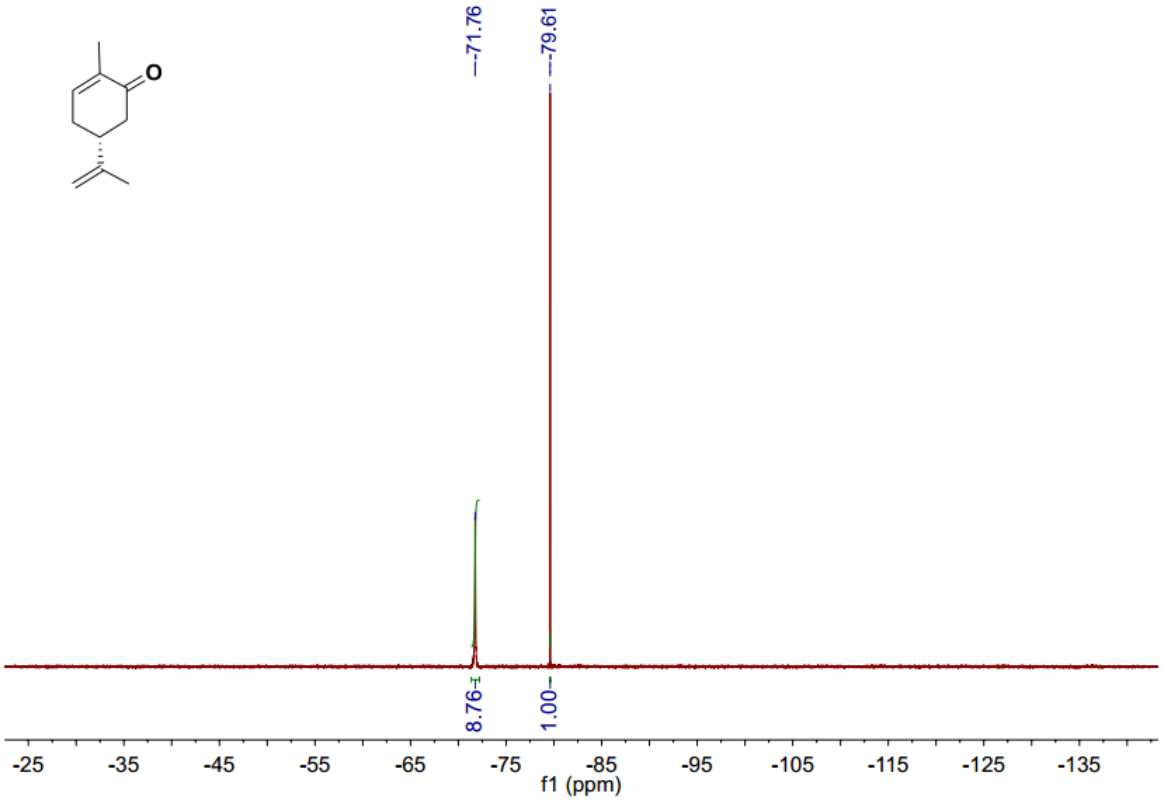

HO
OH
OH
-71.80
-79.61
7.96
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

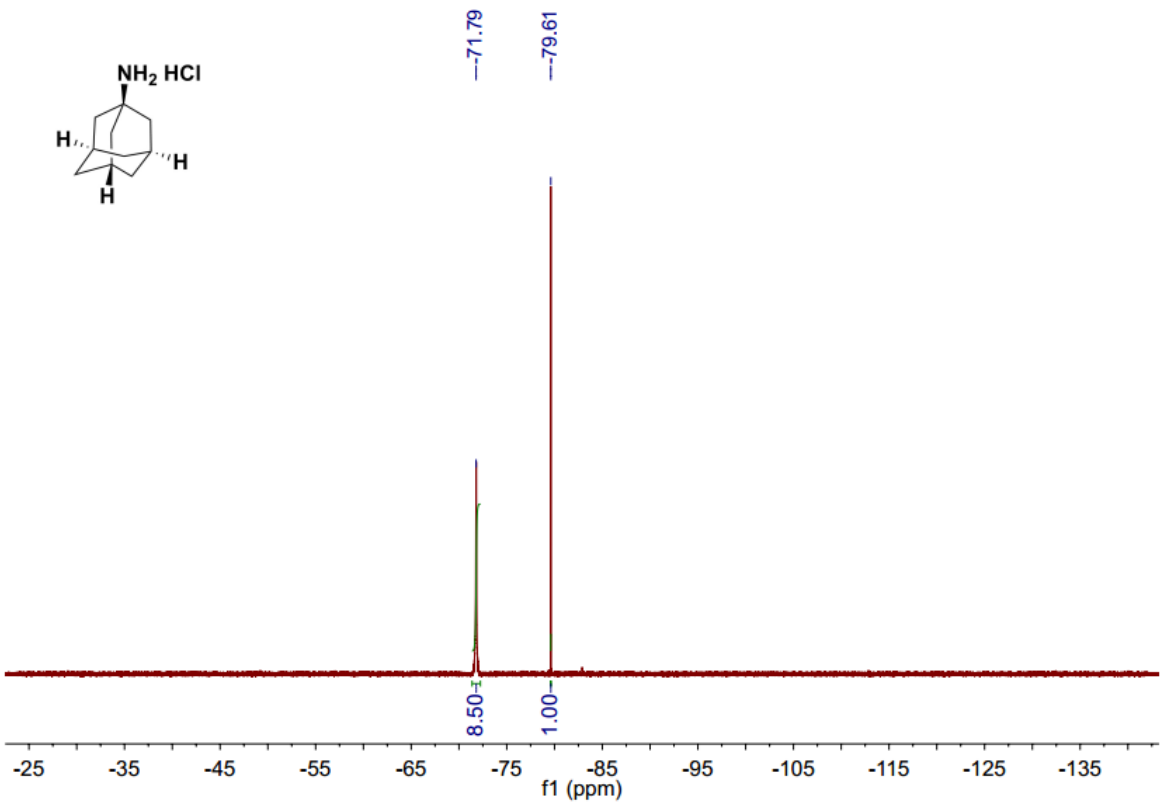

F
F
F
F
F
F
-71.75
-79.61
8.35
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

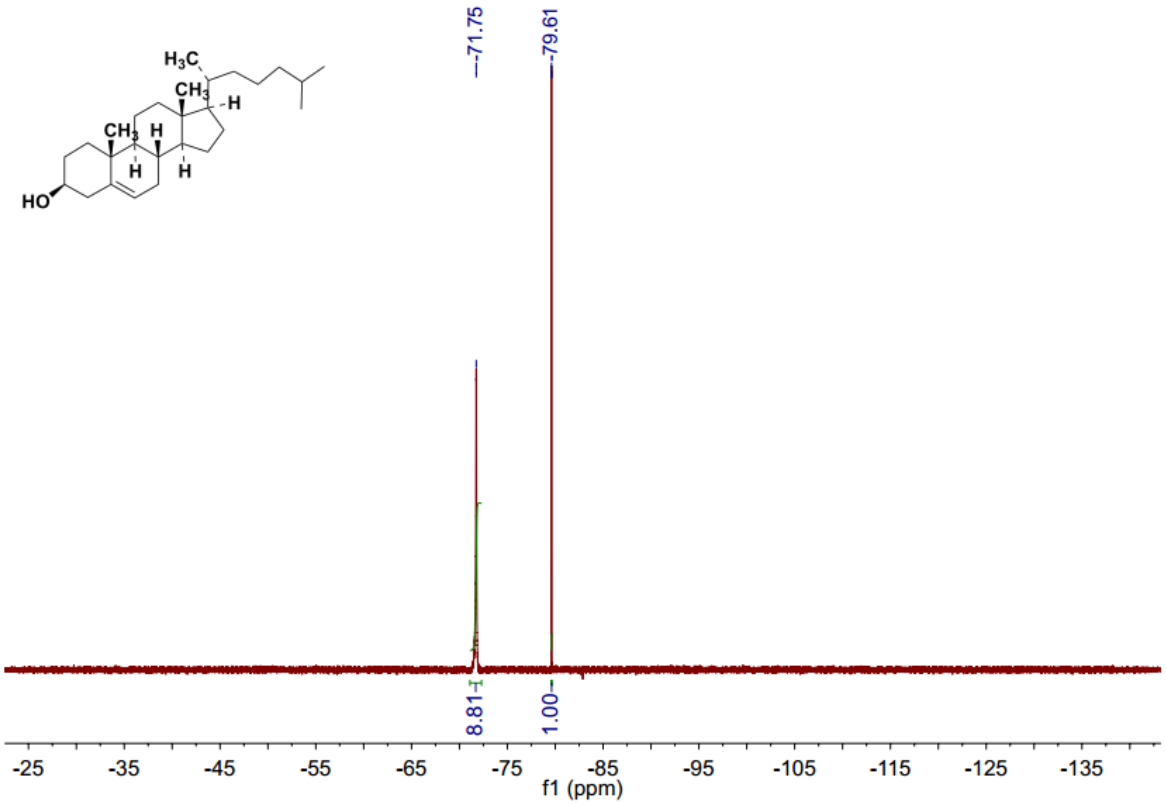

F
F
F
F
F
F
F
F
-71.76
-79.61
8.67
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

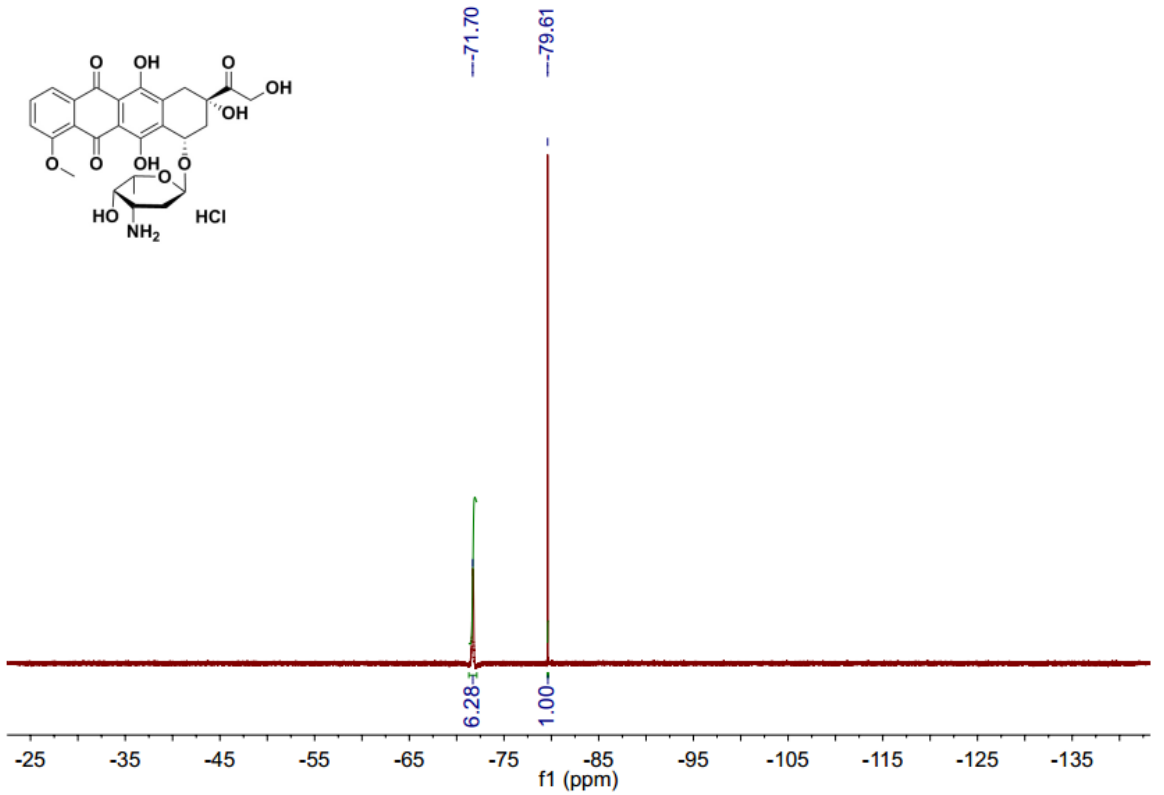

CF3(CF2)7CH2CH2OH
-71.76
-79.61
8.53
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

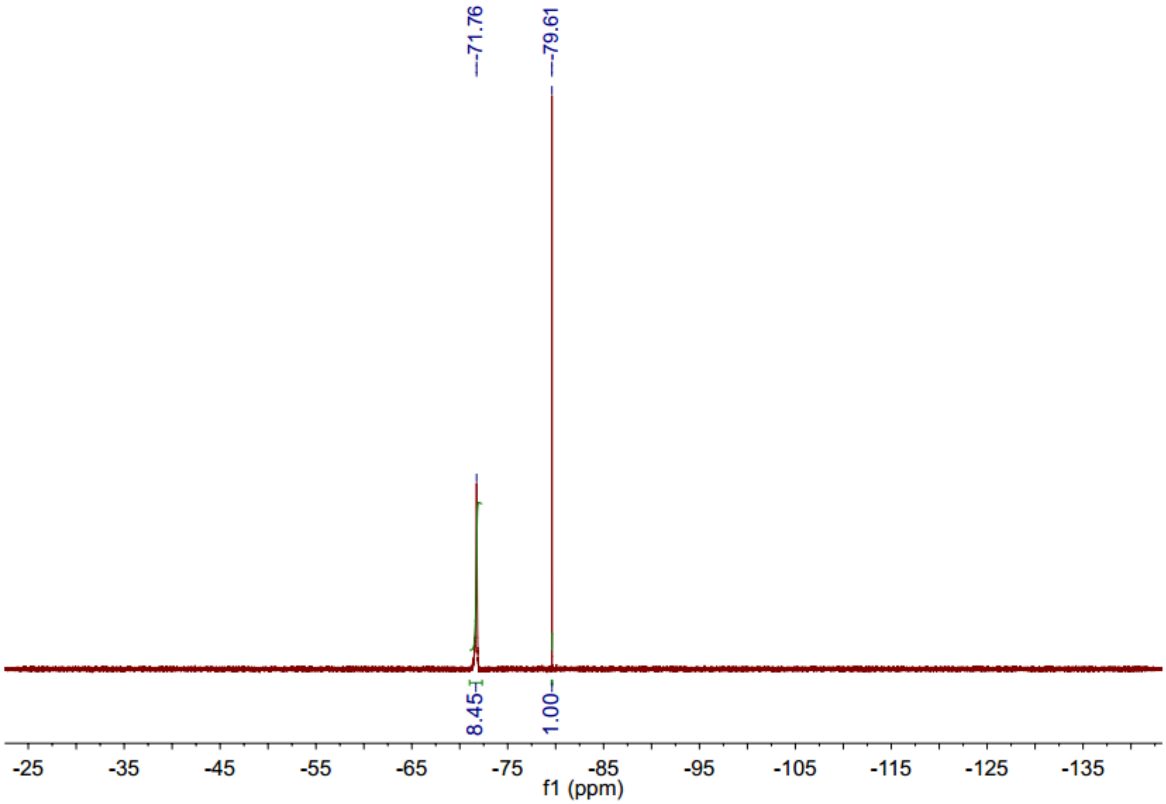

CH3(CH2)7OH
-71.78
-79.61
9.37
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)


O
-71.76
-79.61
8.76
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

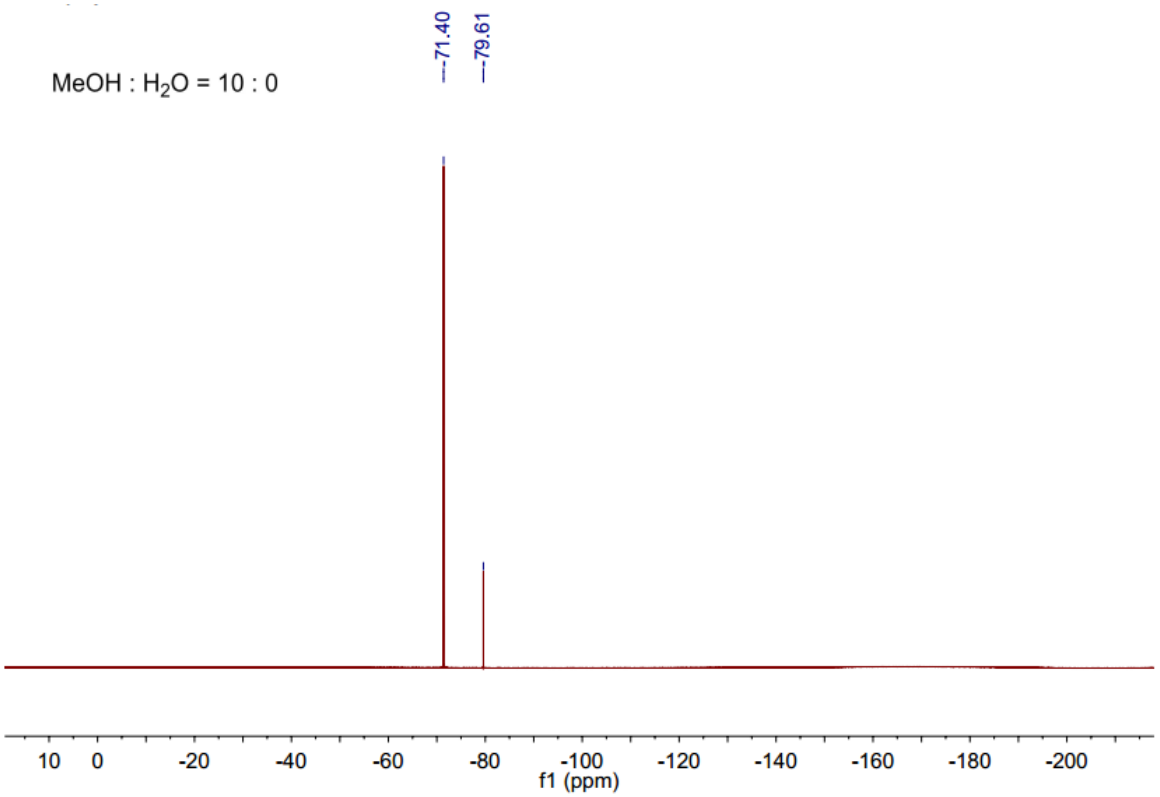

NH2 HCl
H
H
H
-71.79
-79.61
8.50
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

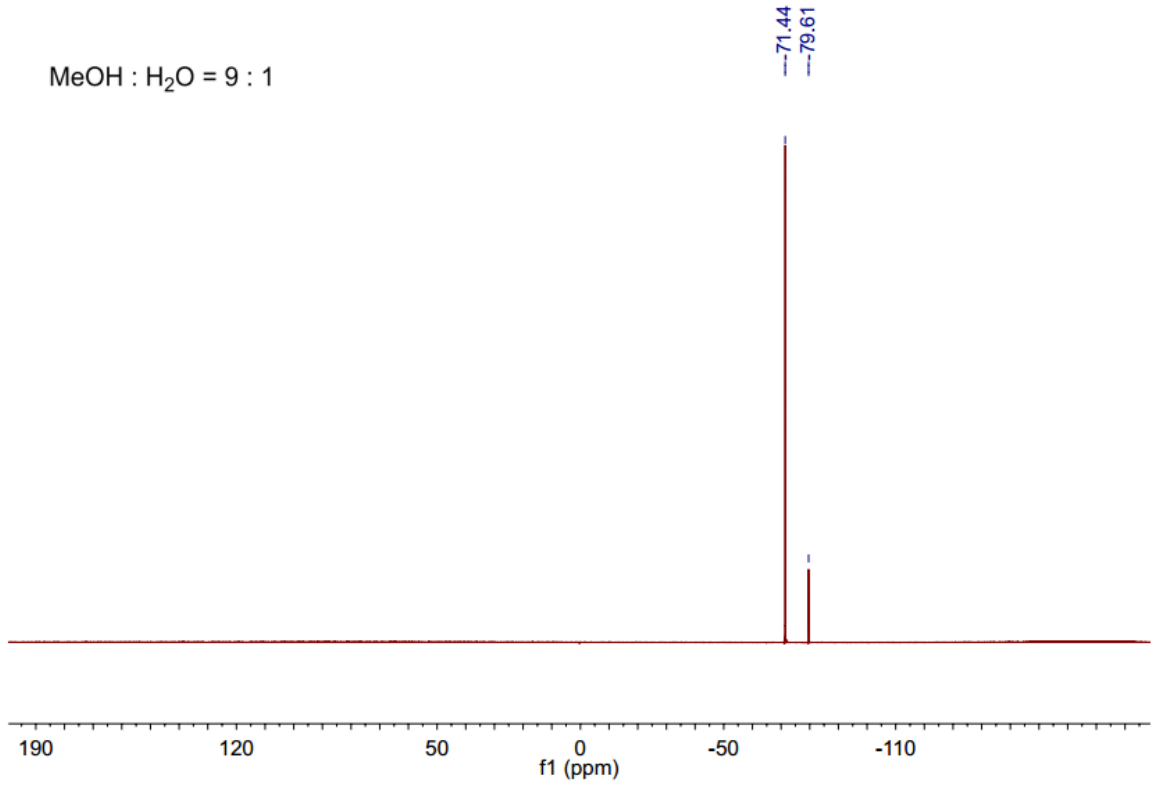

H3C
CH3
H
CH3
H
H
H
HO
-71.75
-79.61
8.81
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)


-71.70
-79.61
6.28
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

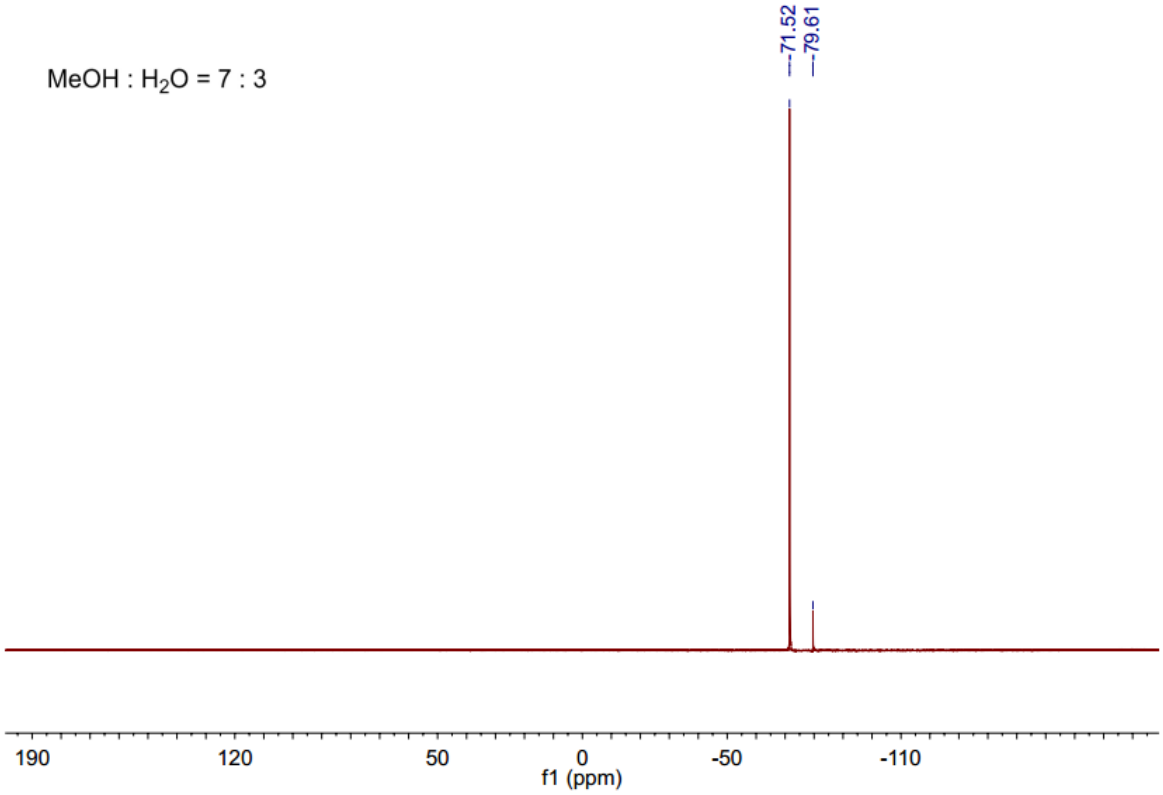

-71.76
-79.61
8.45
1.00
-25
-35
-45
-55
-65
-75
-85
-95
-105
-115
-125
-135
f1 (ppm)

## 10. Copies of solvent-dependent (17.36 mM, 25 °C) $^{19}$F NMR spectra of compounds 2b

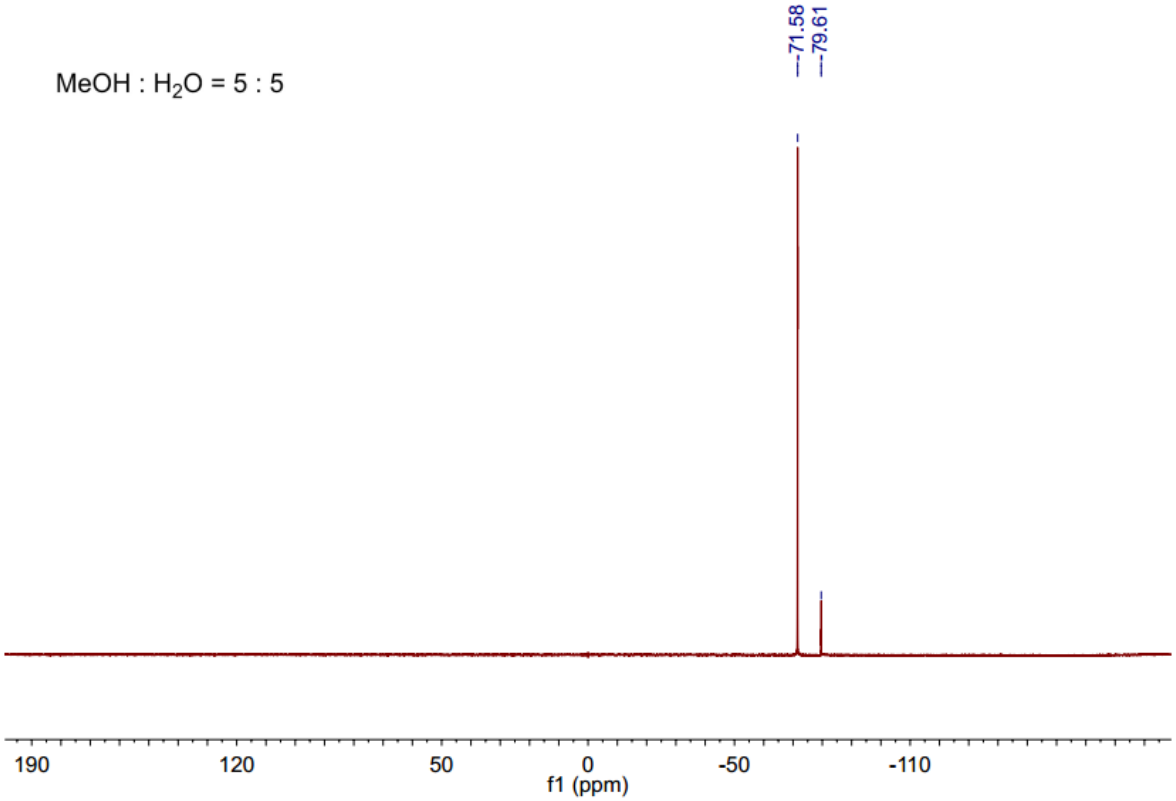


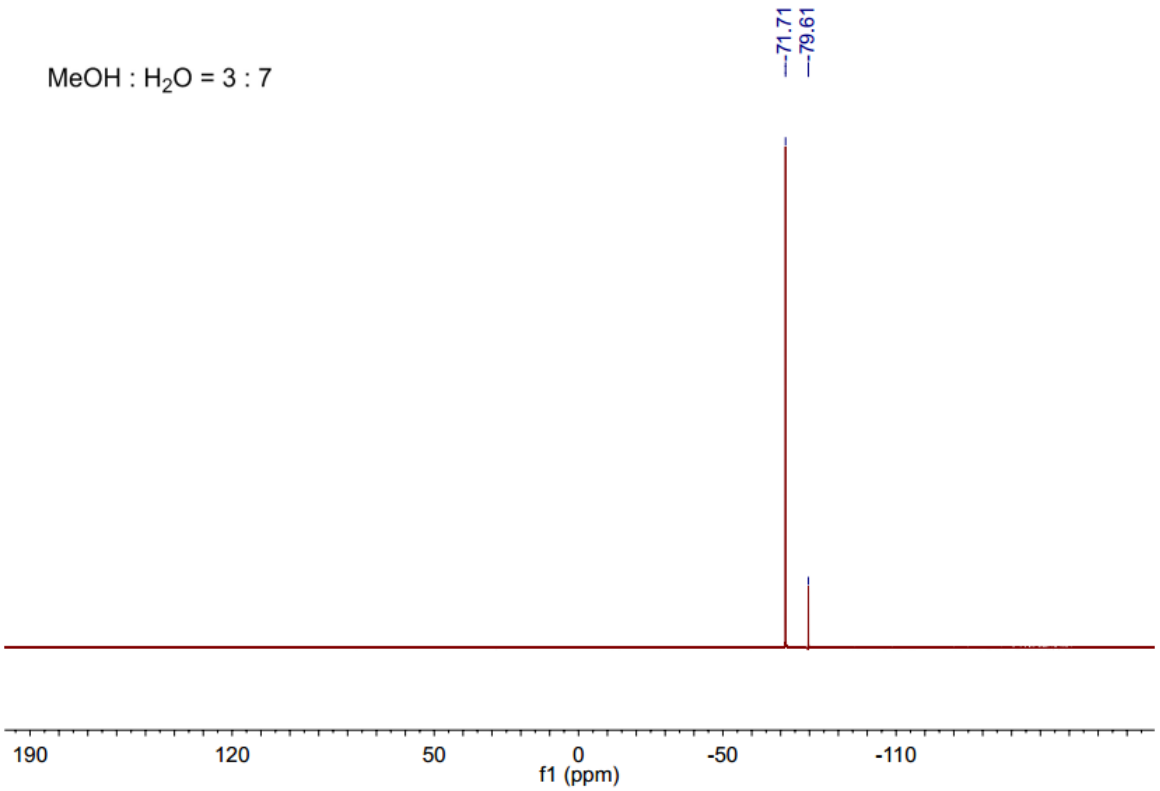
MeOH : $H_2O$ = 7 : 3



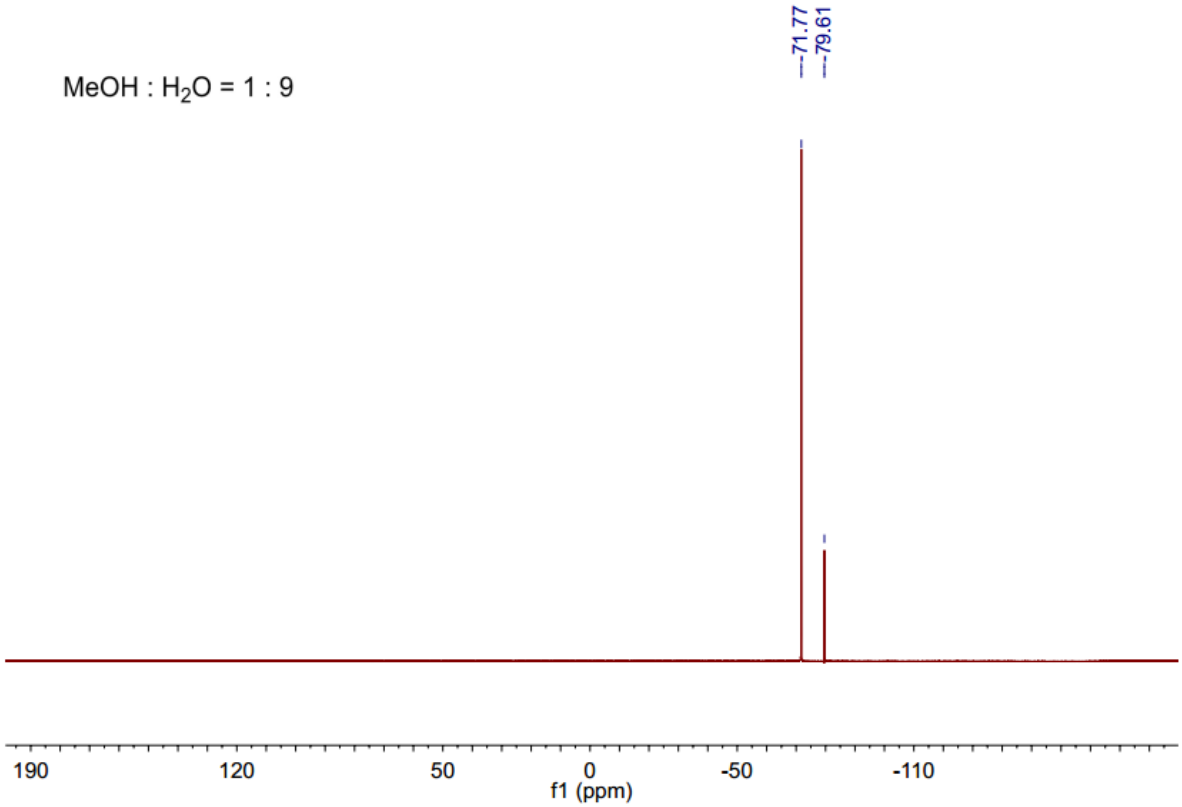

MeOH : $H_2O$ = 5 : 5



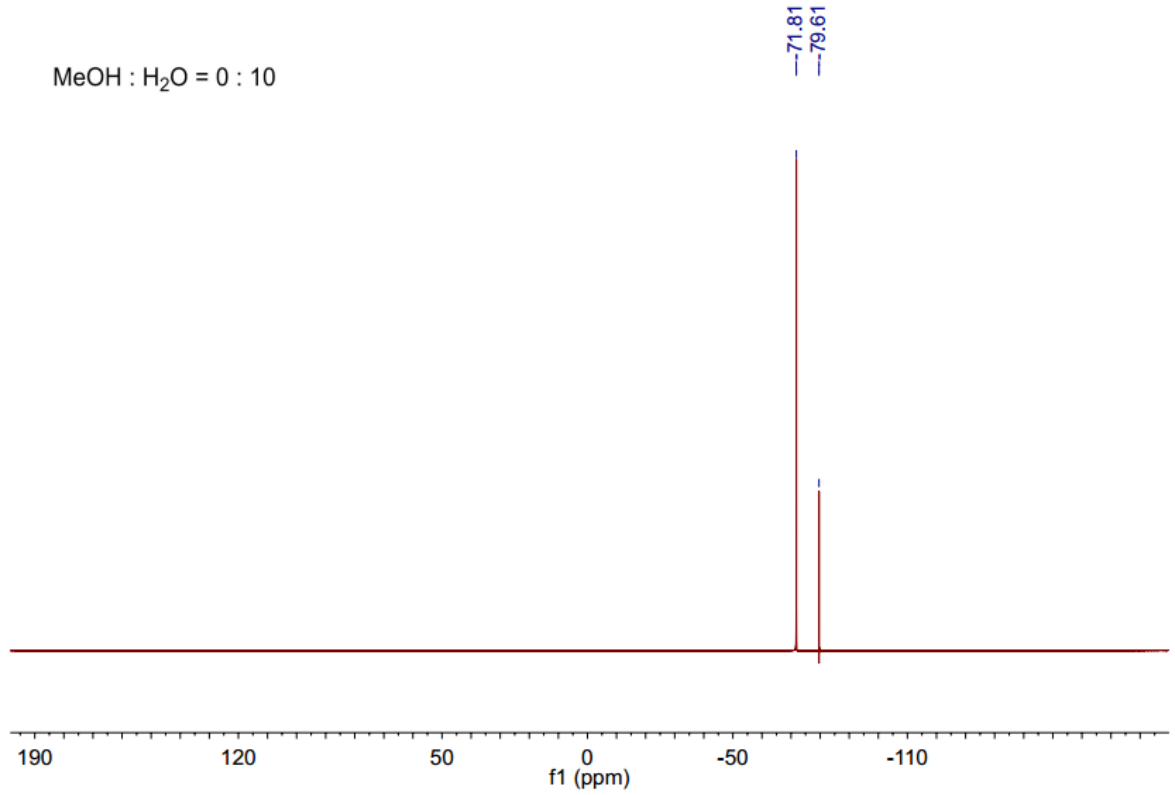
MeOH : $H_2O$ = 3 : 7



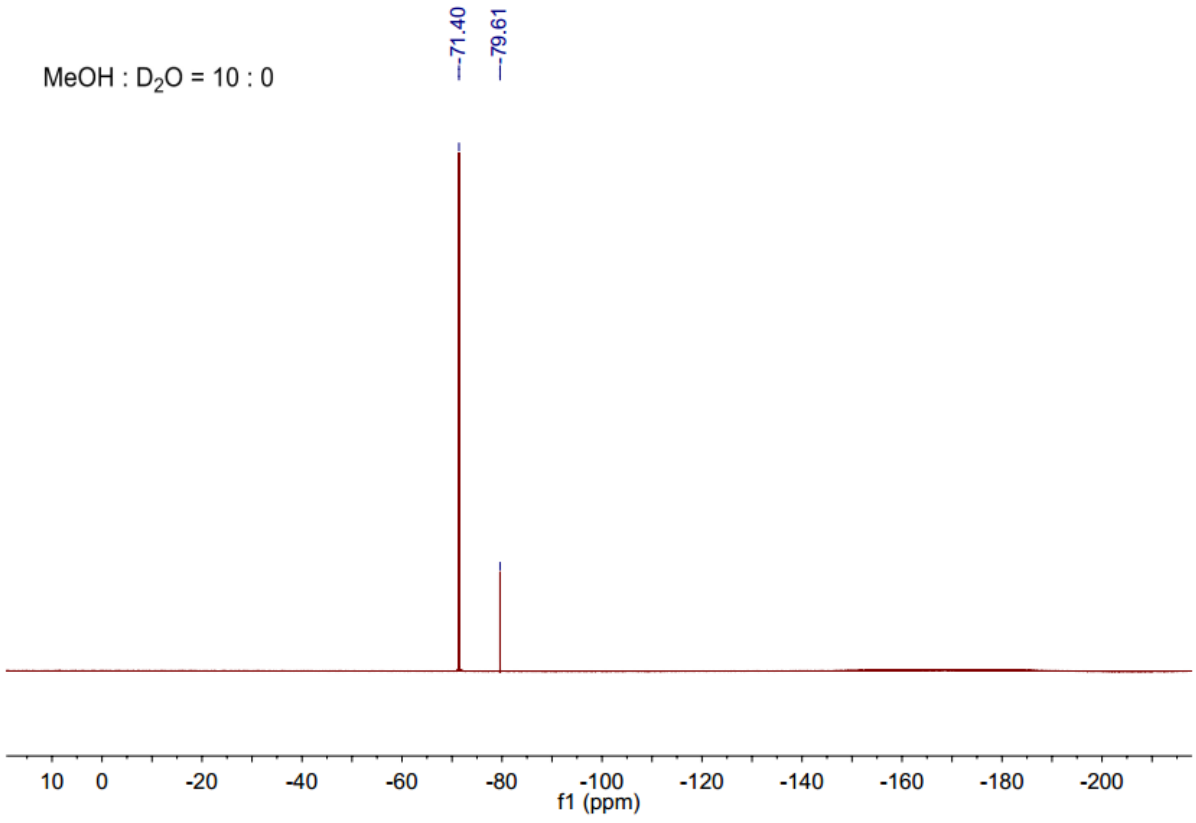

MeOH : $H_2O$ = 1 : 9



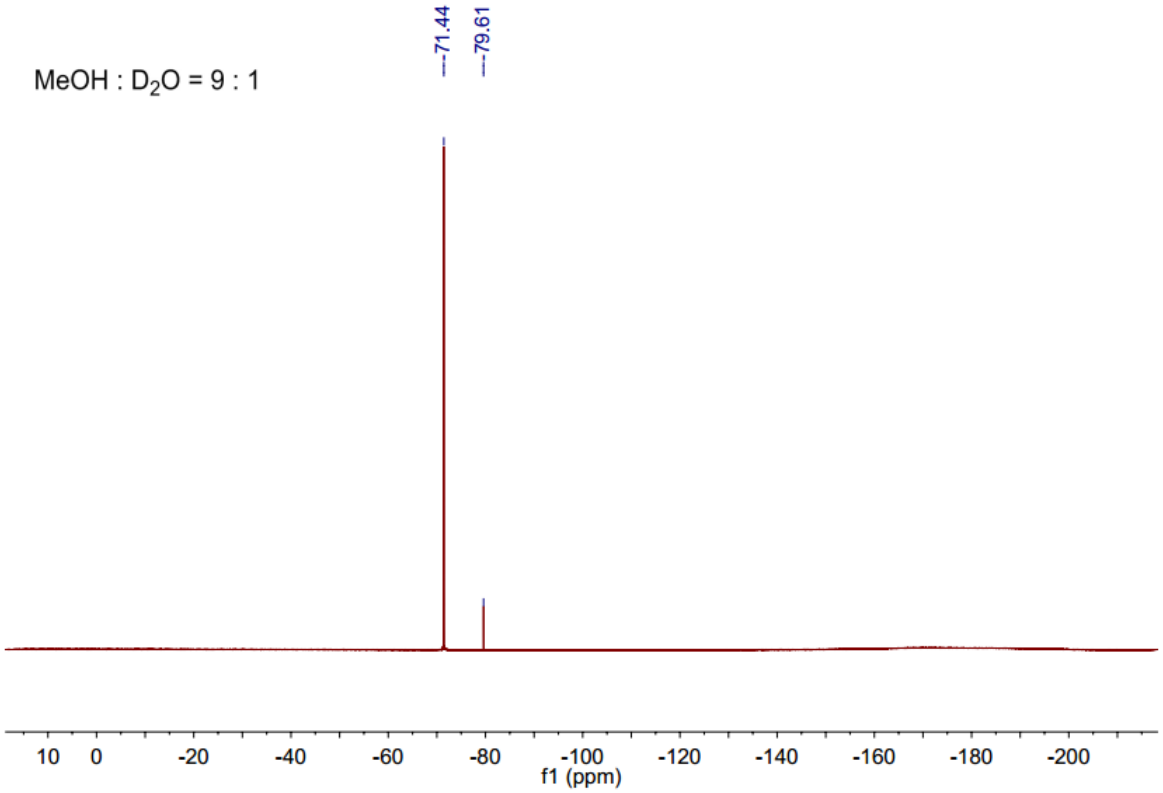
MeOH : $H_2O$ = 0 : 10



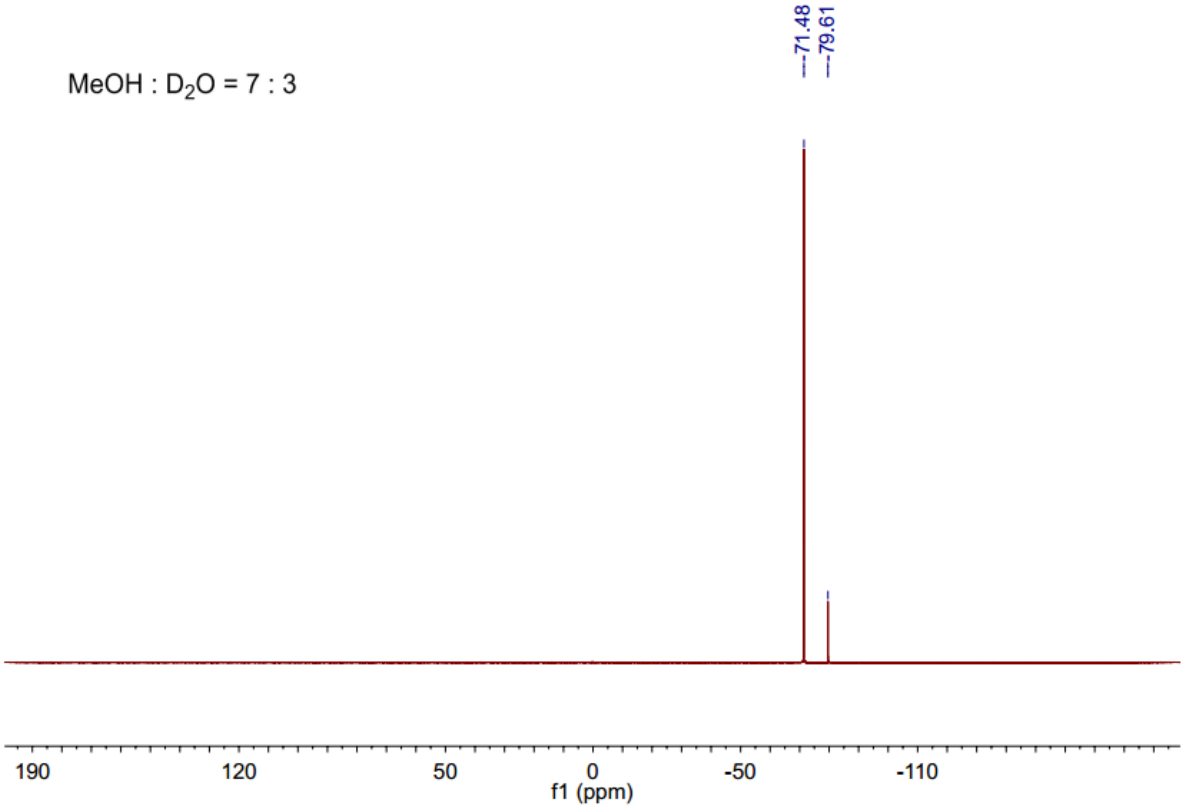

MeOH : $D_2O$ = 10 : 0



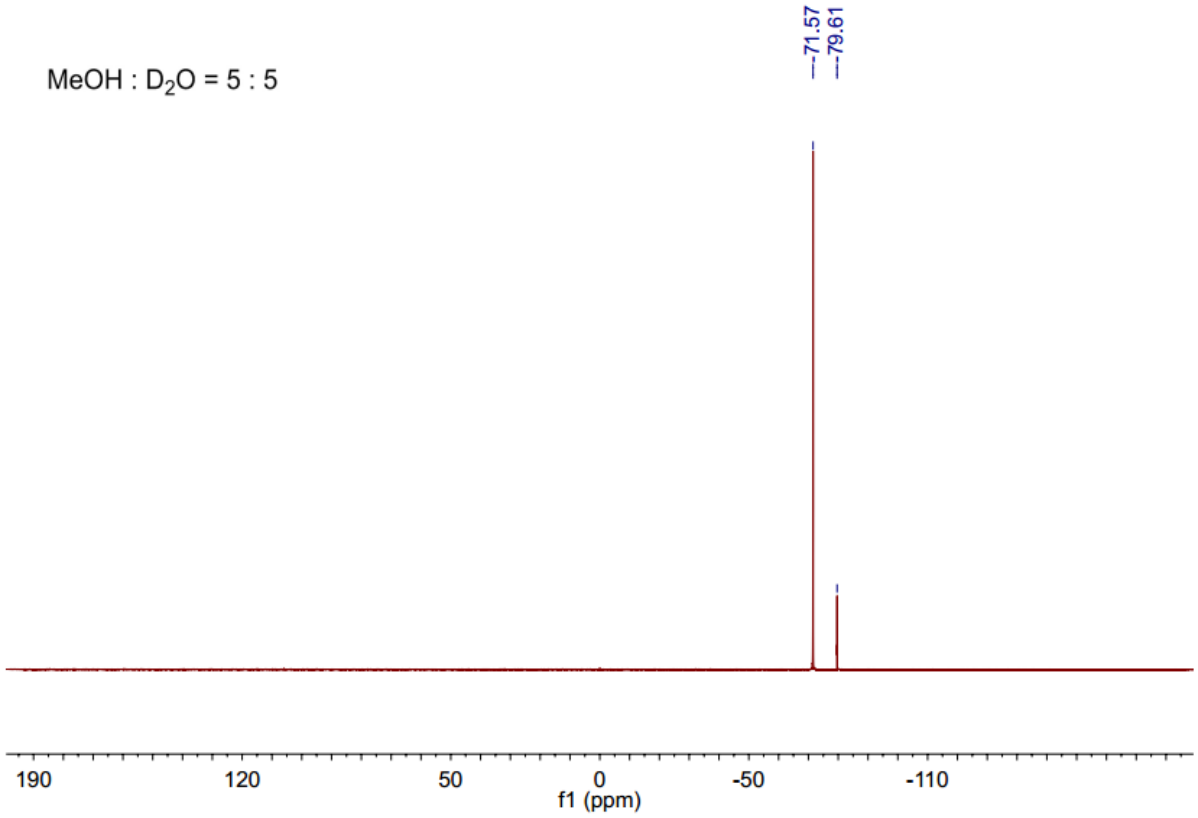
MeOH : $D_2O$ = 9 : 1



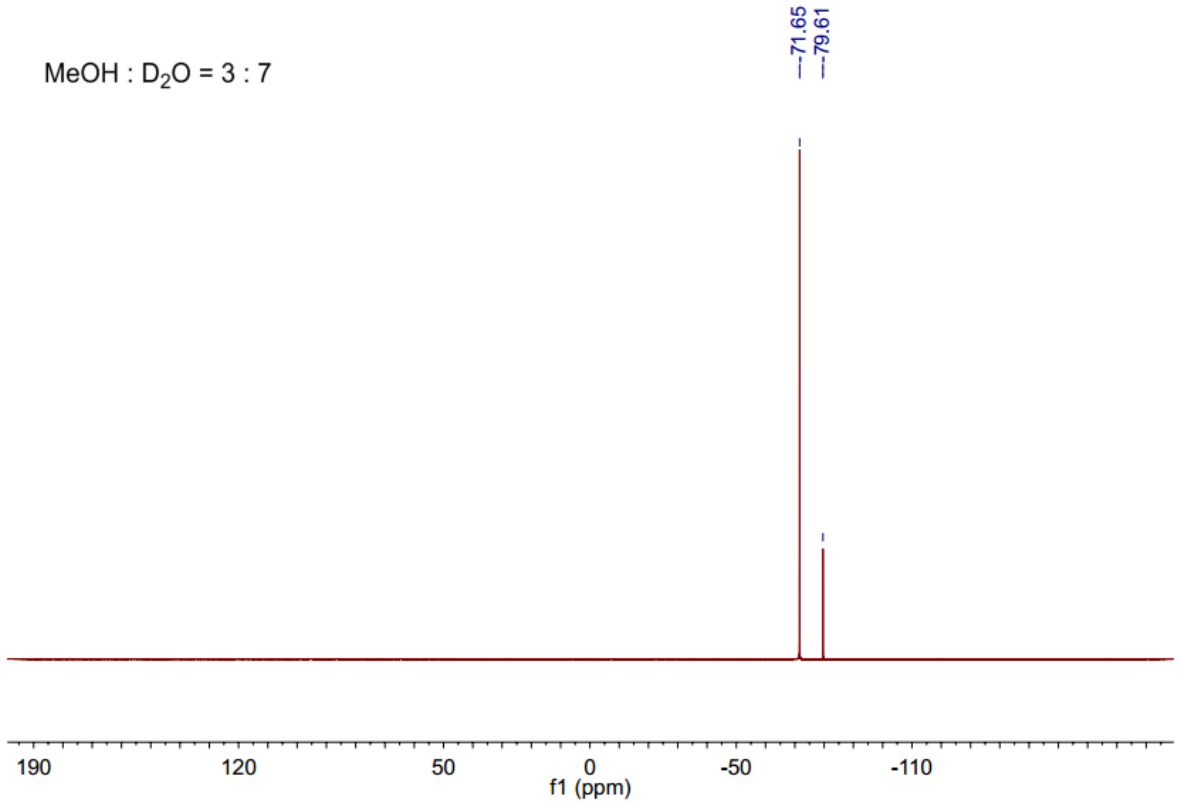

MeOH : $D_2O$ = 7 : 3



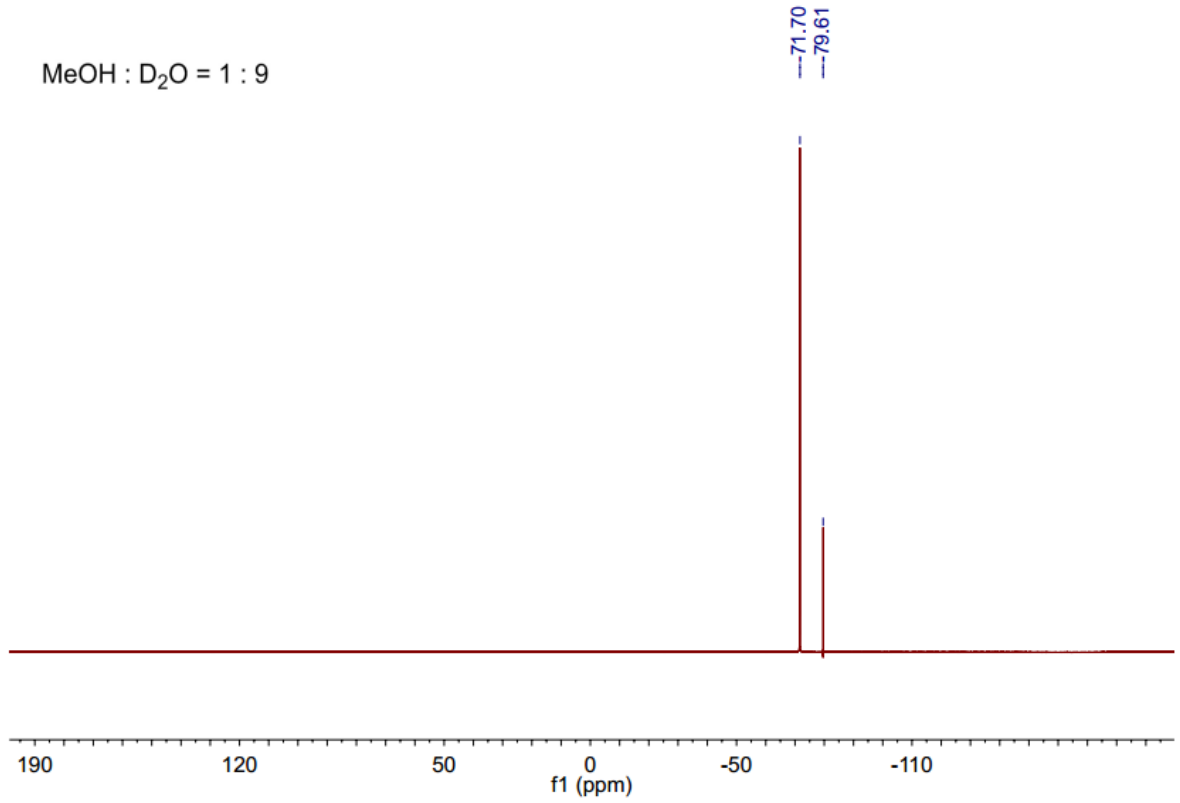
MeOH : $D_2O$ = 5 : 5



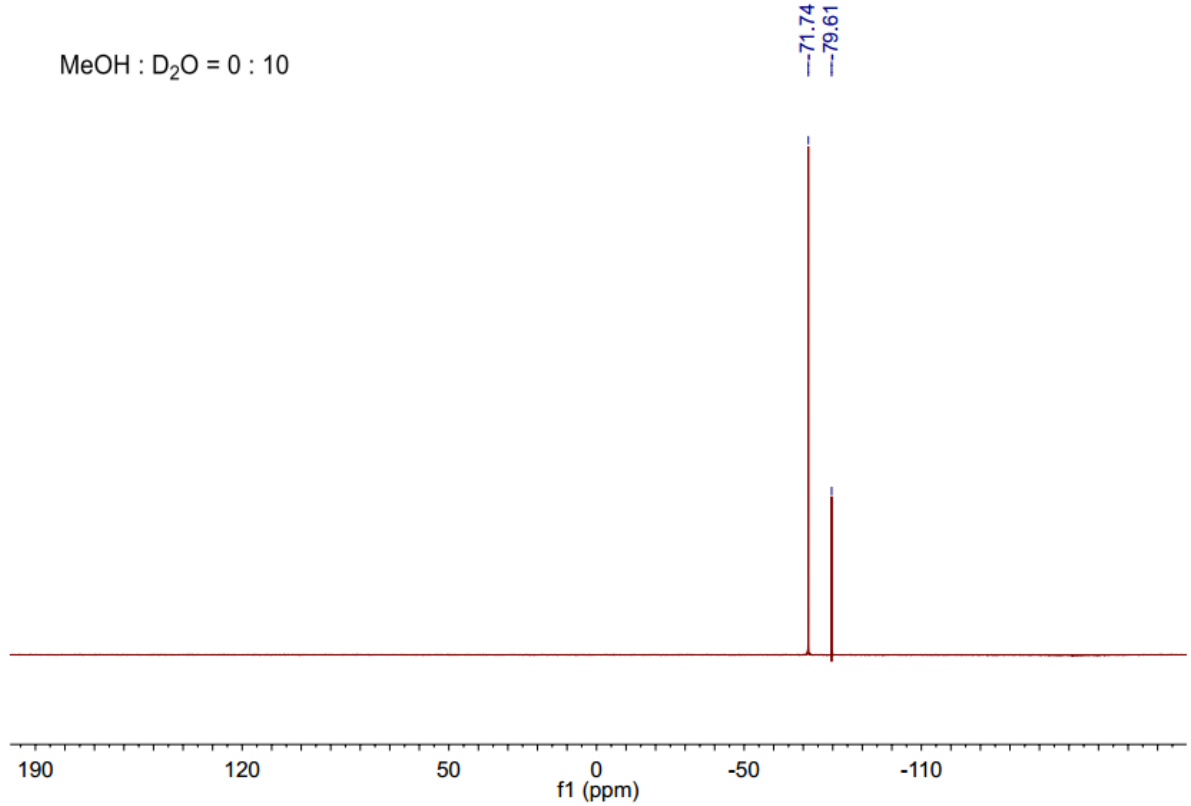

MeOH : $D_2O$ = 3 : 7



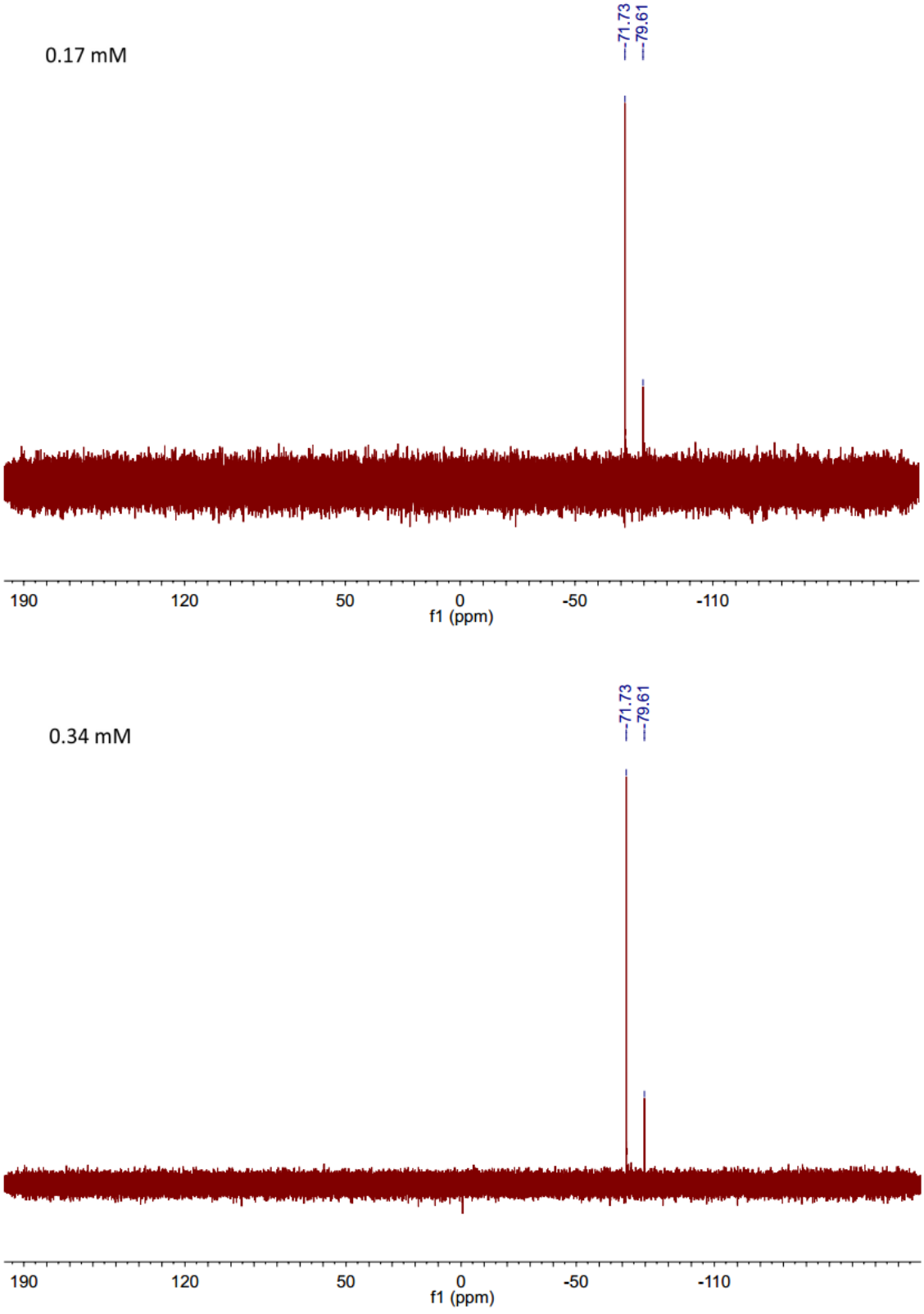
MeOH : $D_2O$ = 1 : 9

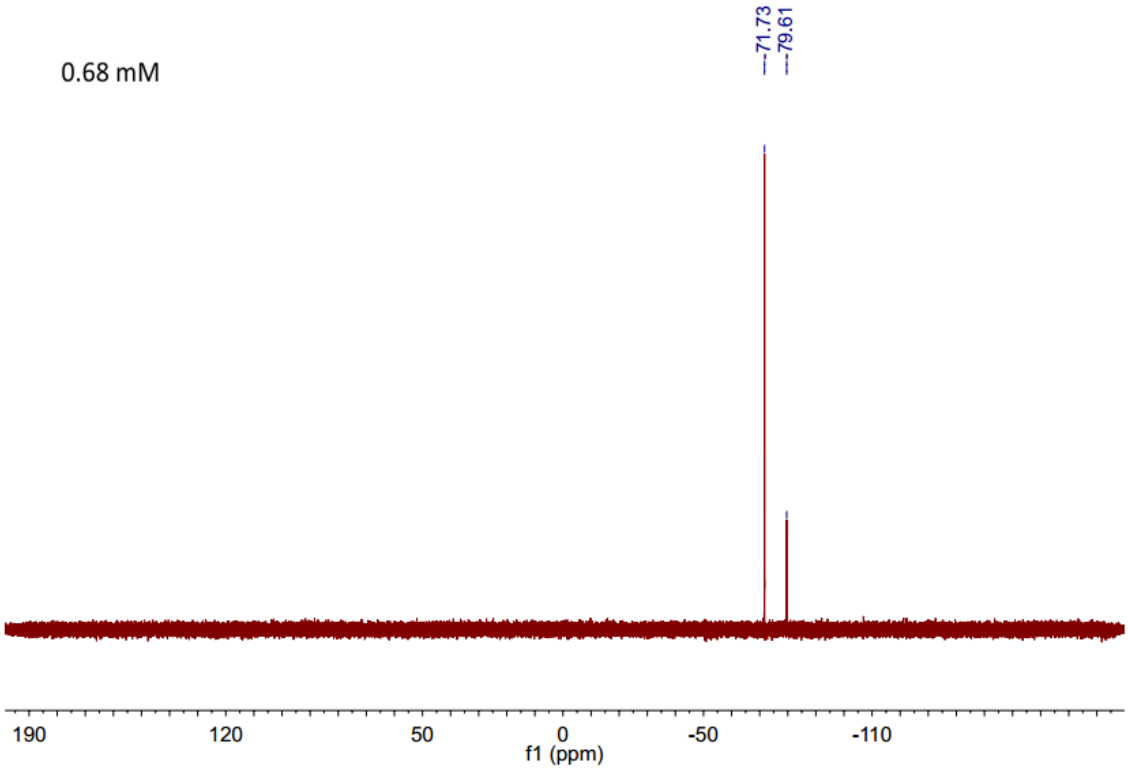


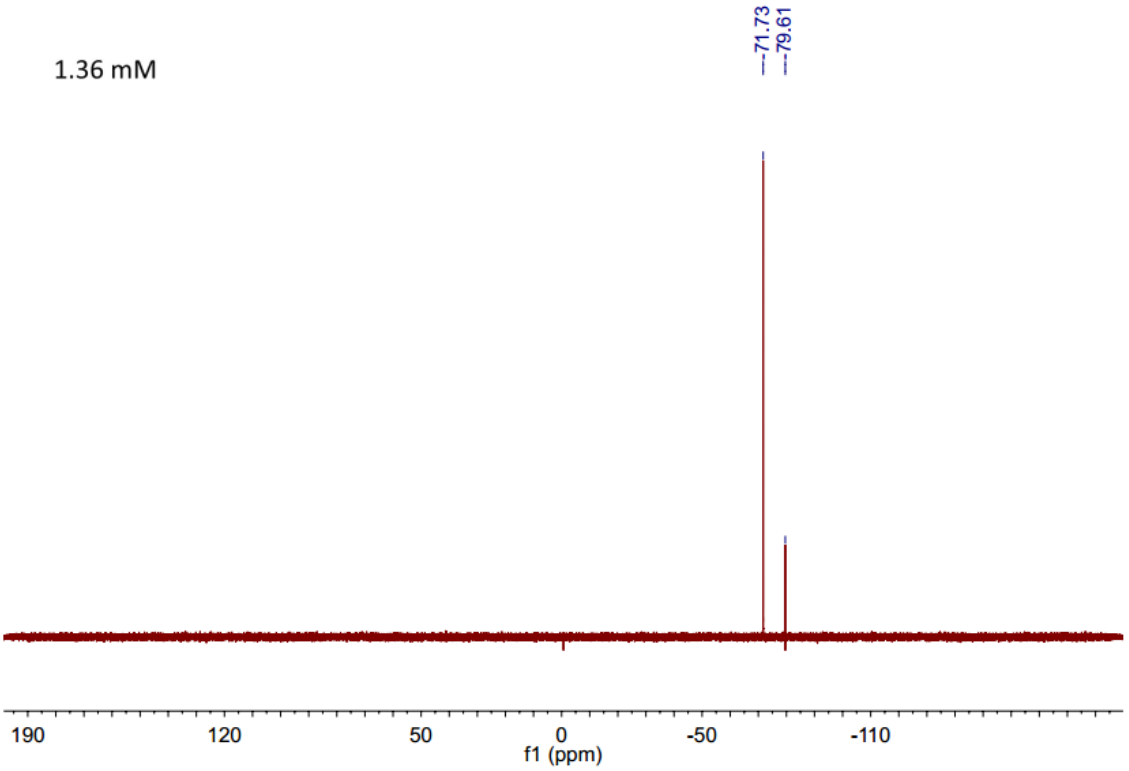

MeOH : $D_2O$ = 0 : 10



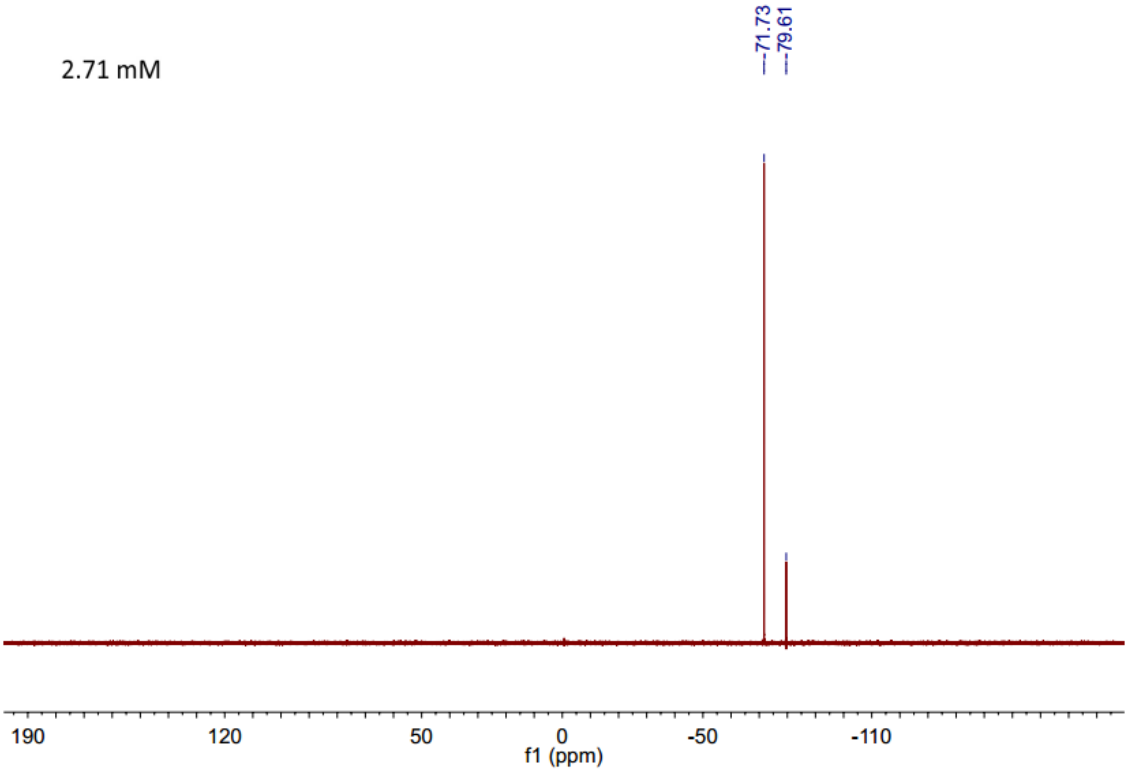
## 11. Copies of concentration-dependent (25 °C, in $D_2O$) $^{19}F$ NMR spectra of compounds 2b



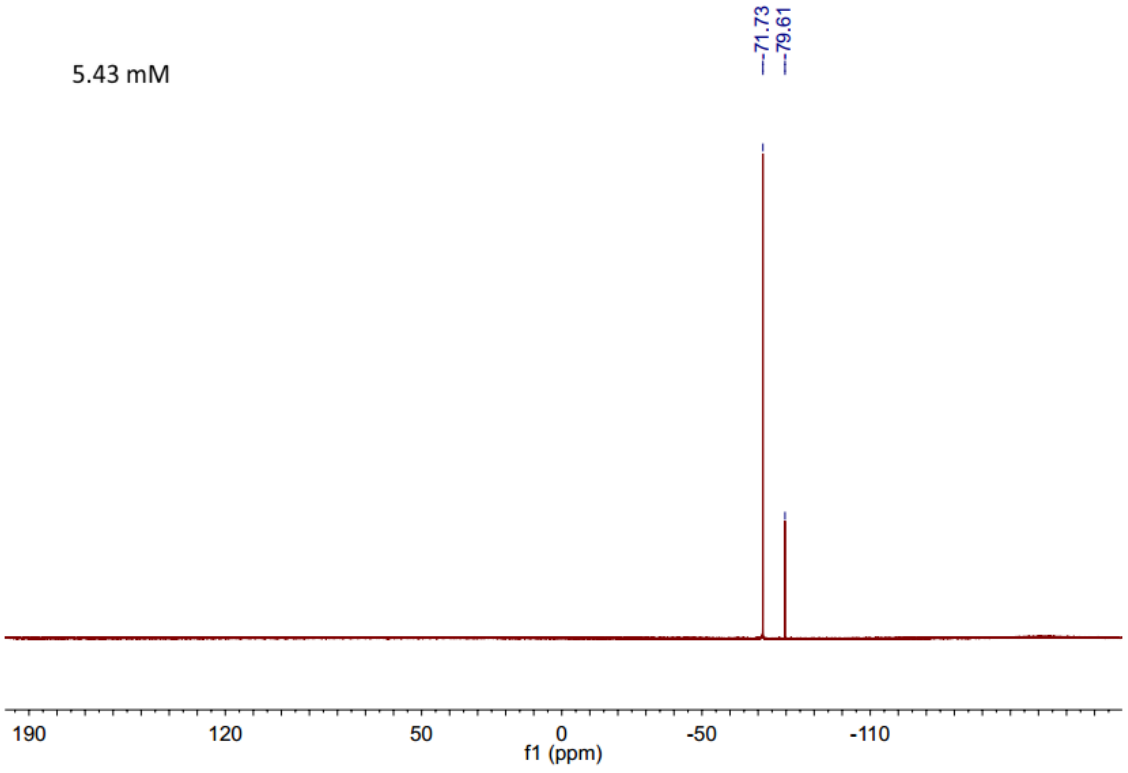

0.68 mM
71.73
79.61
190
120
50
0
-50
-110
f1 (ppm)


1.36 mM
71.73
79.61
190
120
50
0
-50
-110
f1 (ppm)

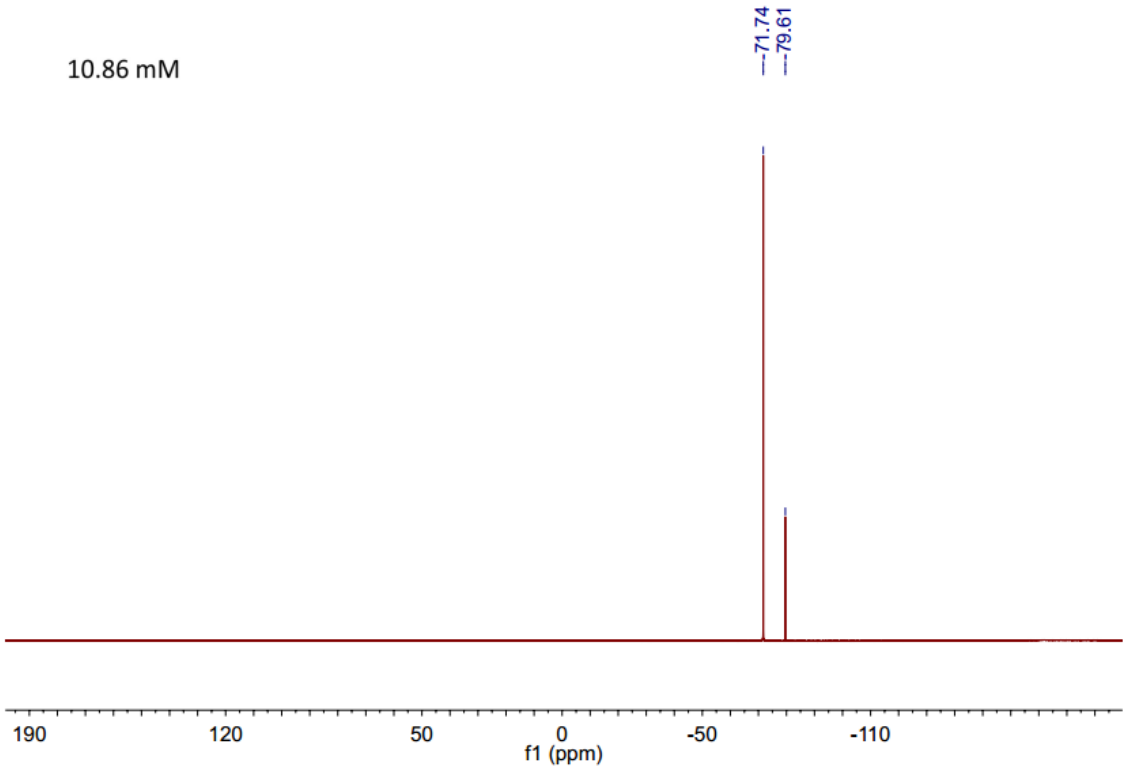
2.71 mM


71.73
79.61
190
120
50
0
-50
-110
f1 (ppm)

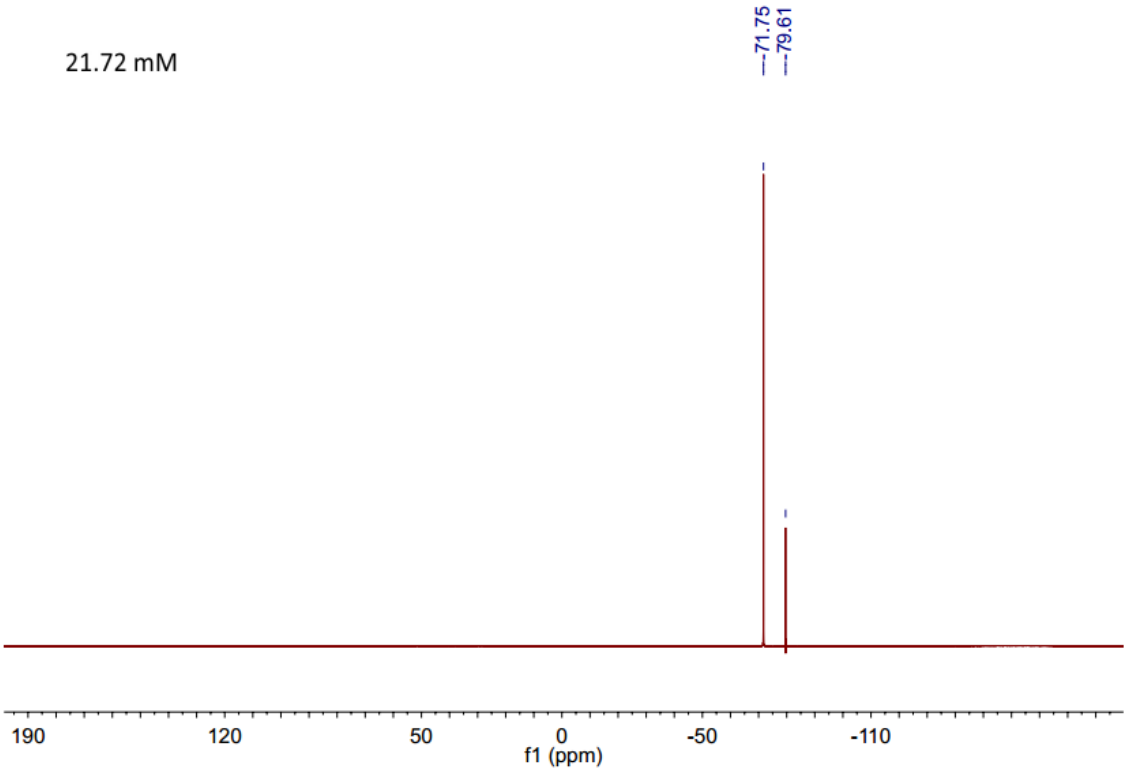
5.43 mM

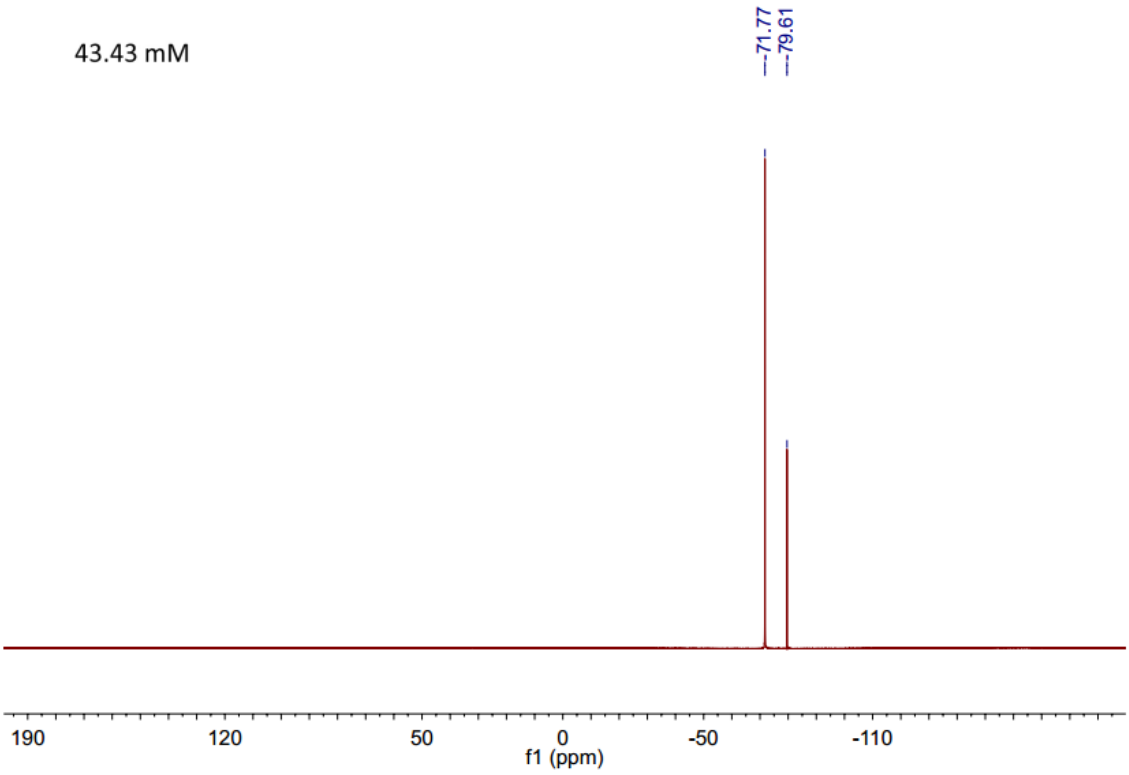

71.73
79.61
190
120
50
0
-50
-110
f1 (ppm)

10.86 mM

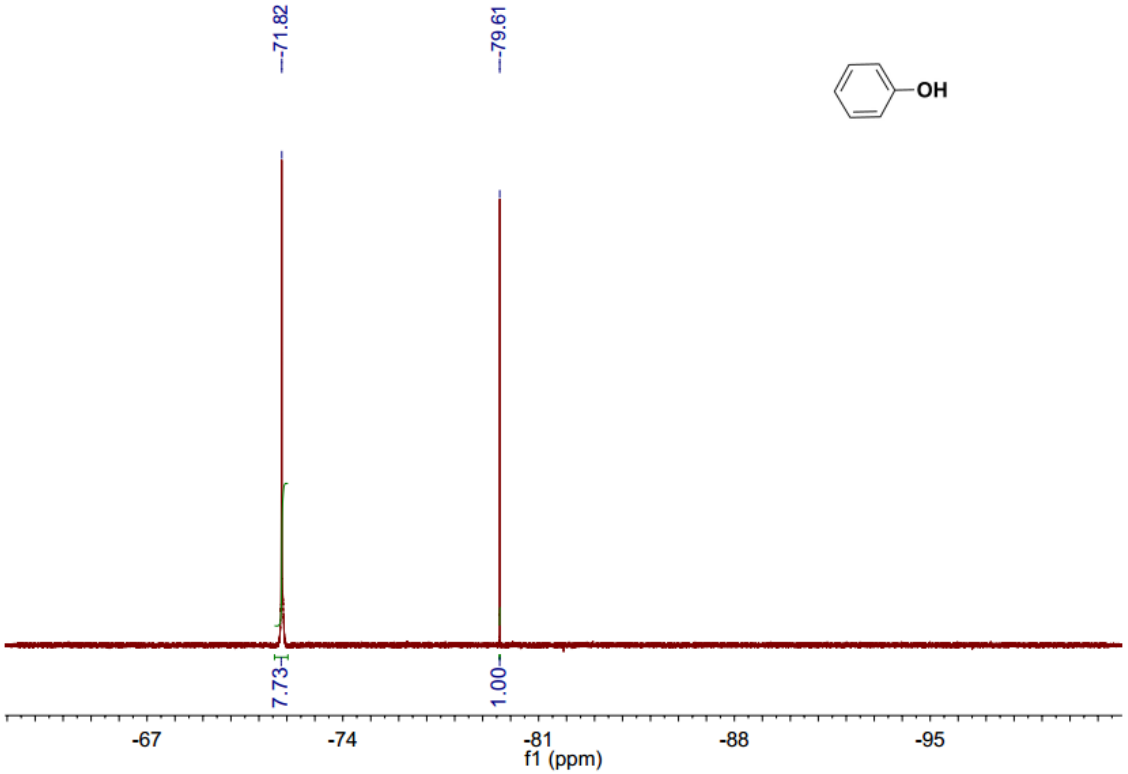


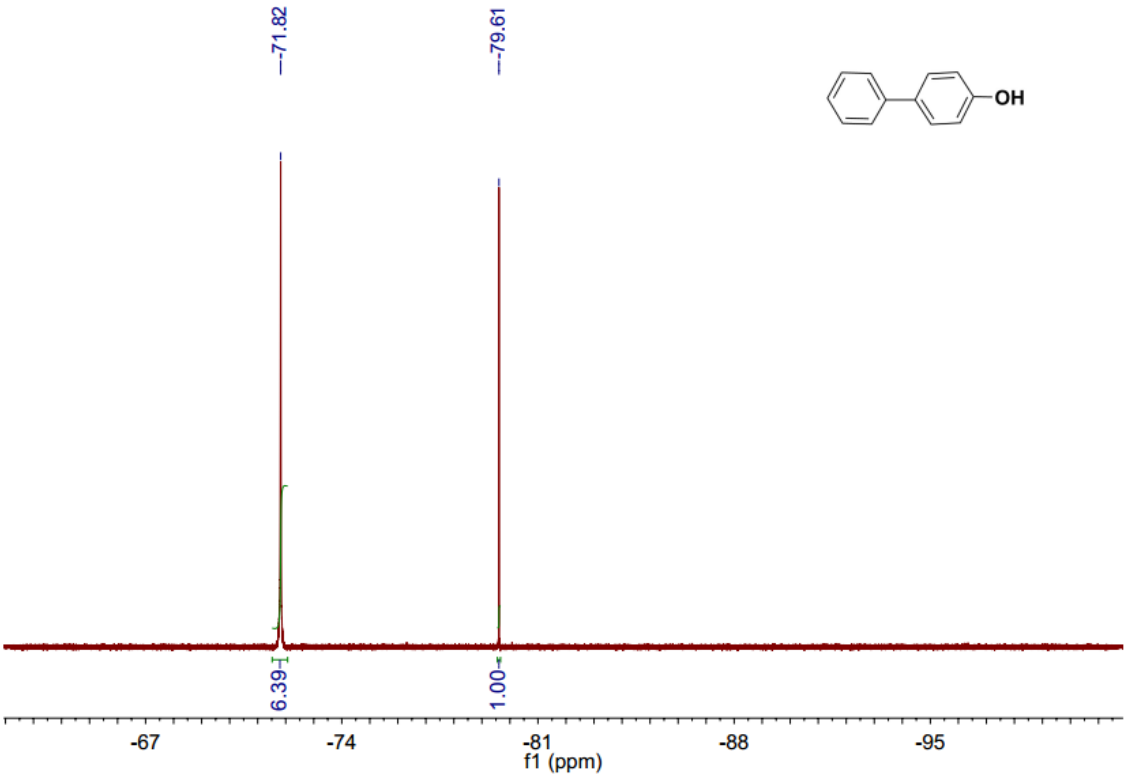

21.72 mM

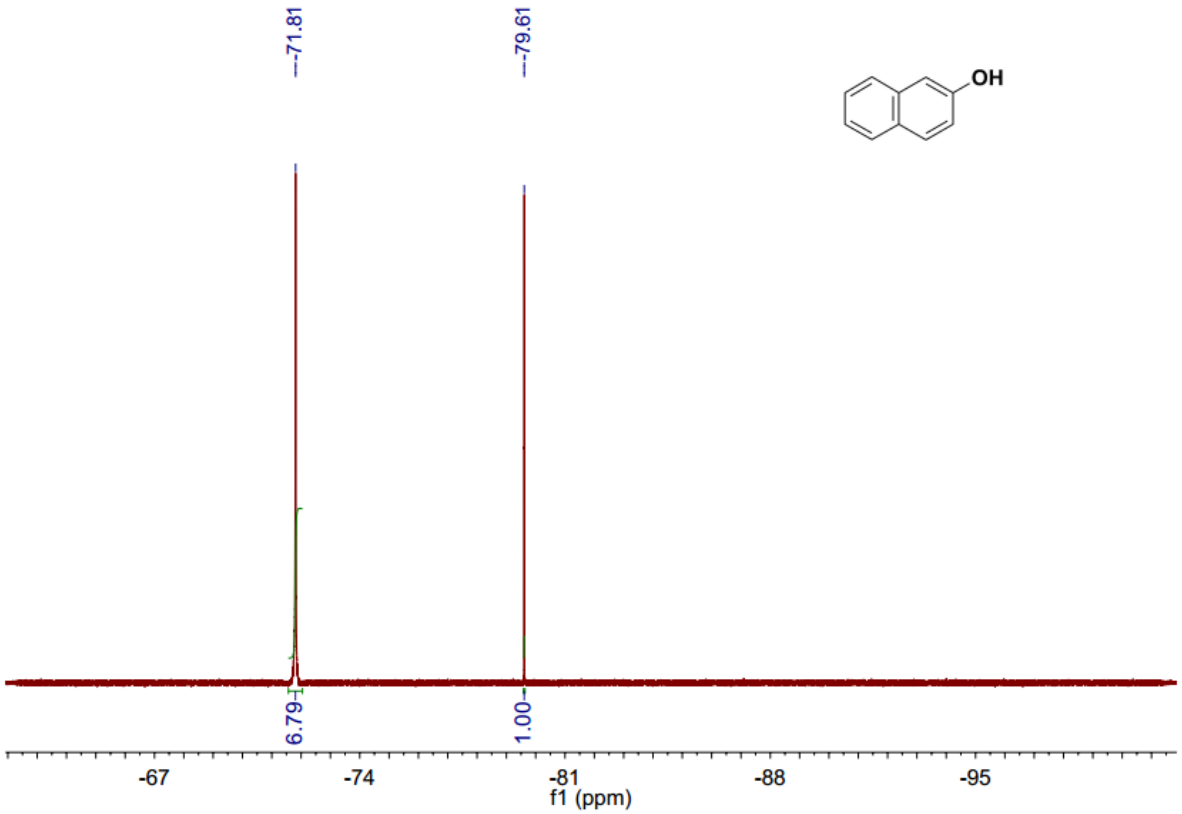


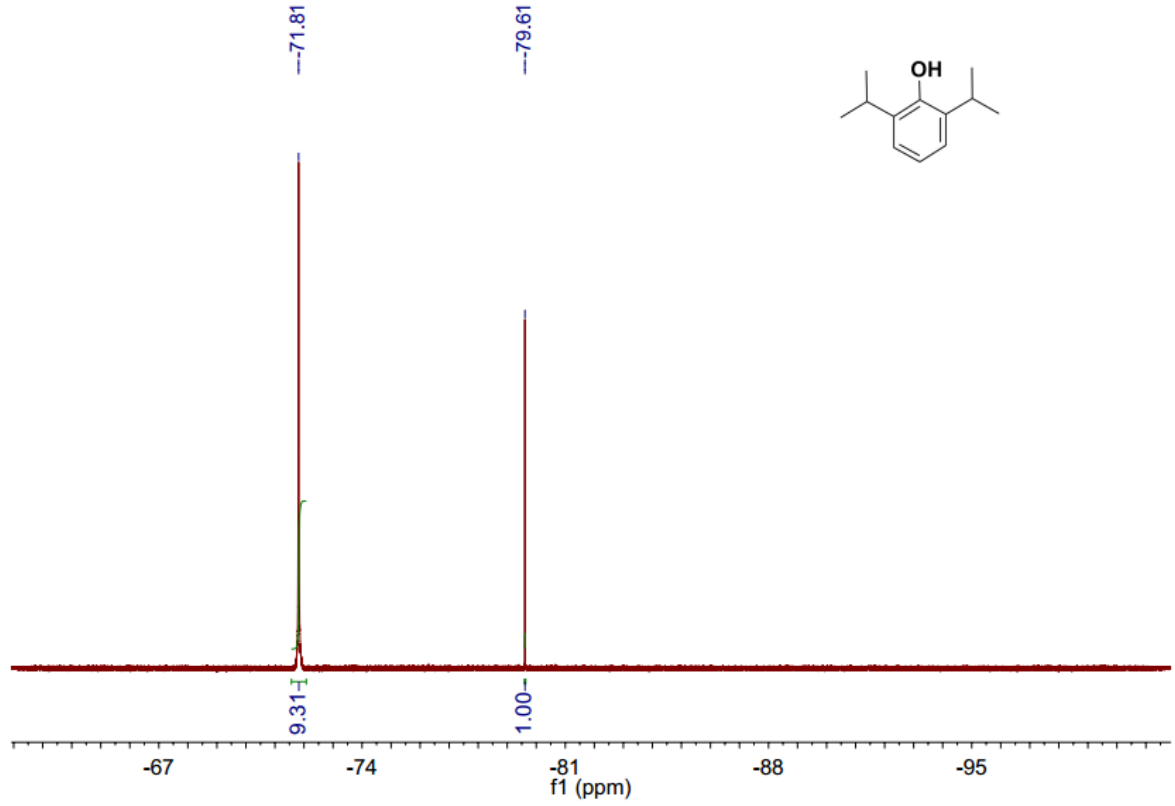

43.43 mM
-71.77
-79.61
190
120
50
0
-50
-110
f1 (ppm)

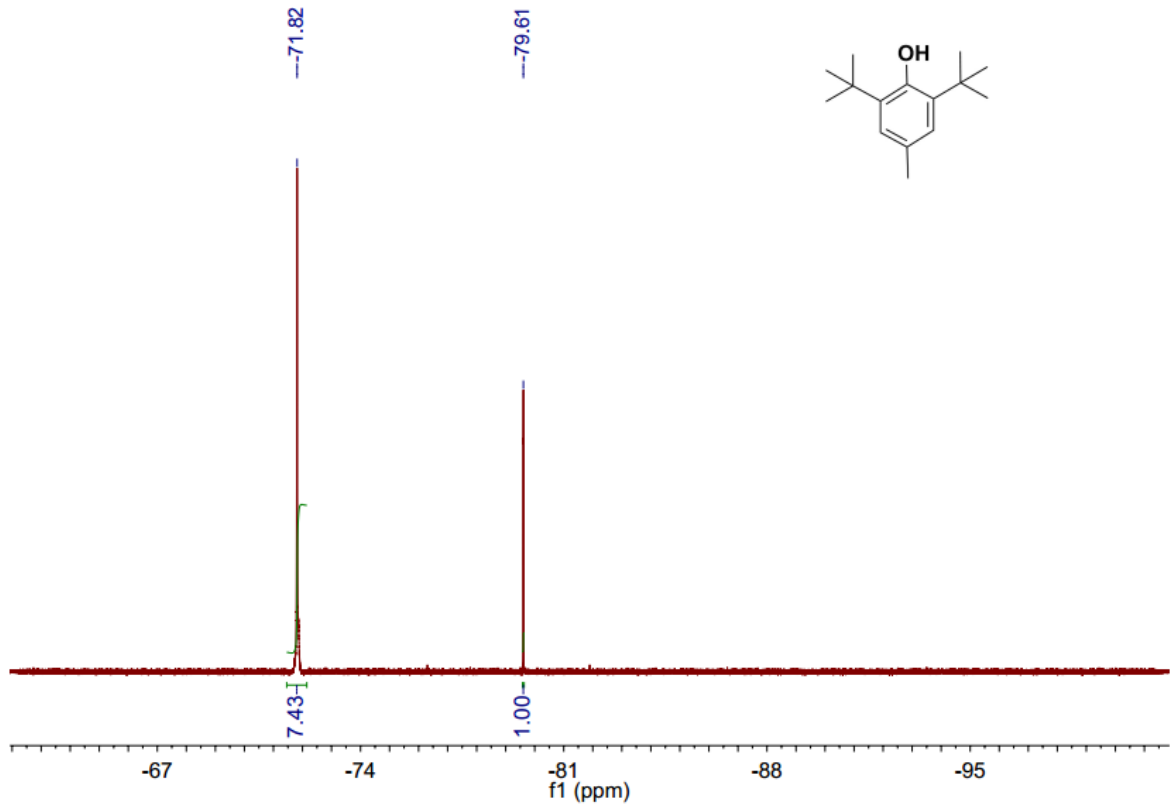
**12. Copies of additive-dependent (25 $^{o}$C, in $H_2O$) $^{19}$F NMR spectra of compounds 2b (8.68 mM for 2b and Eq 1.0 for additives)**

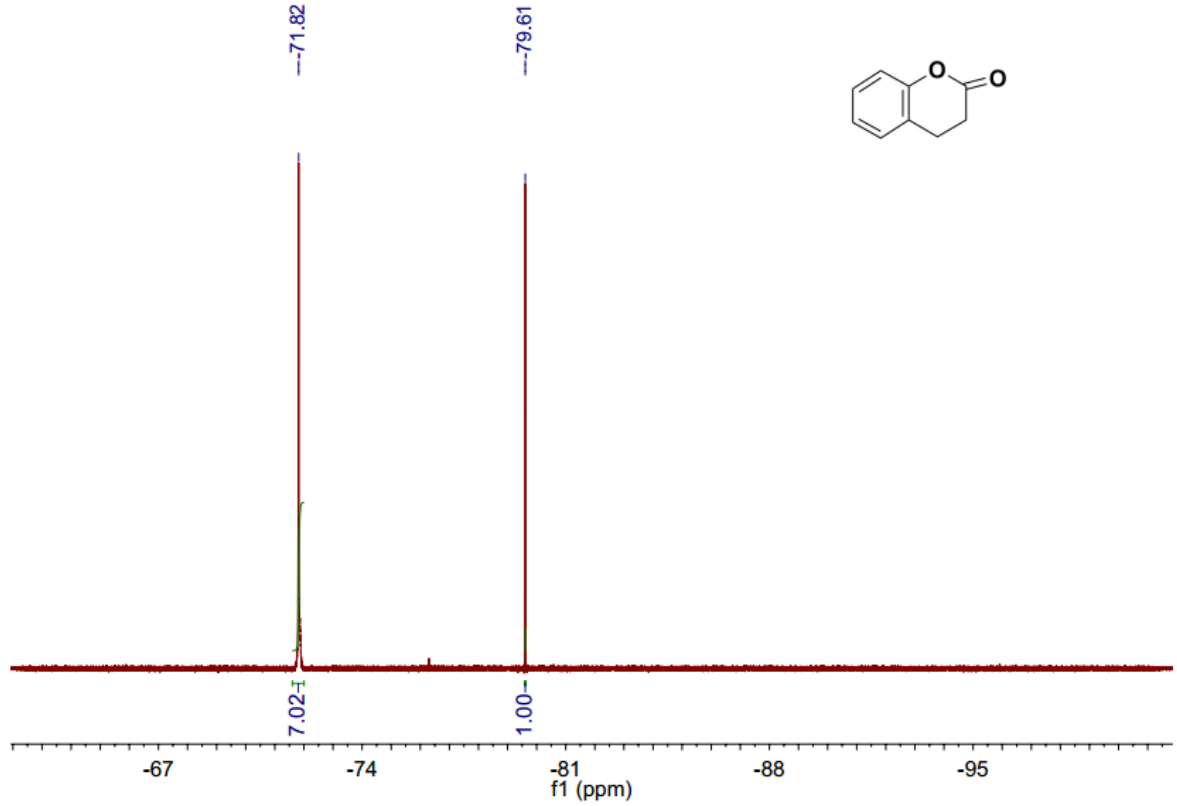


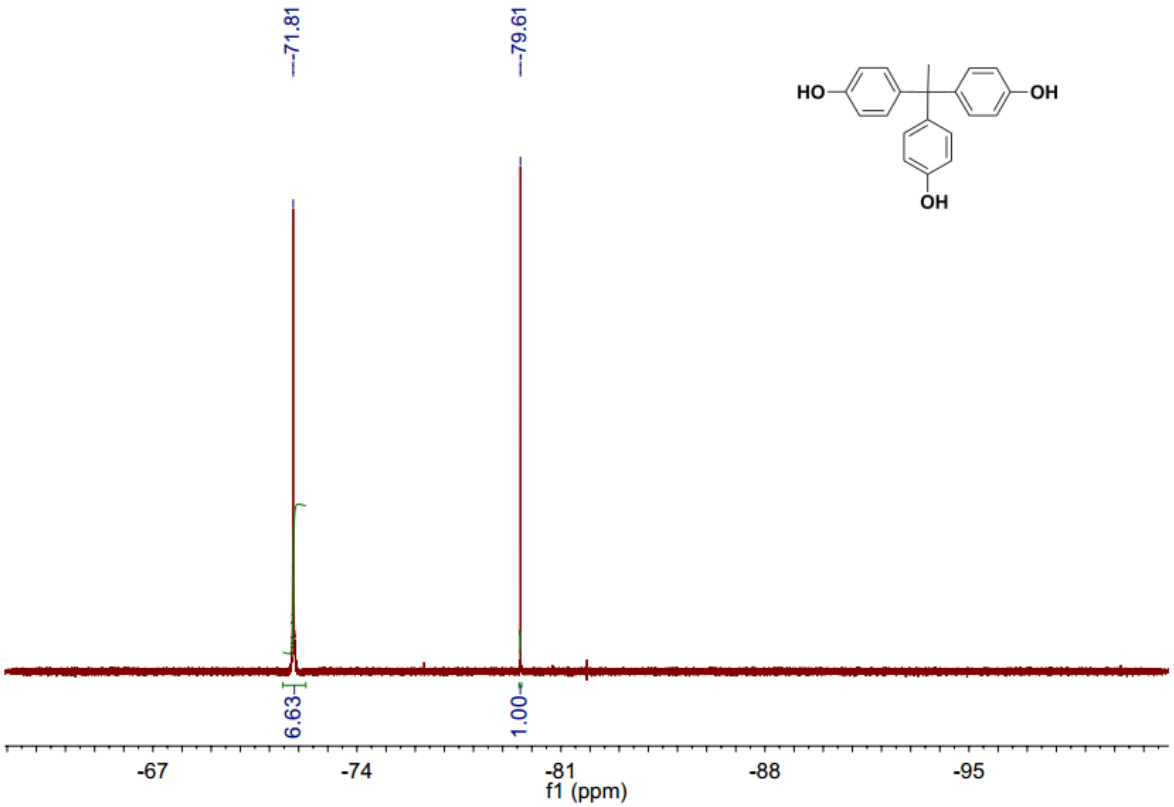



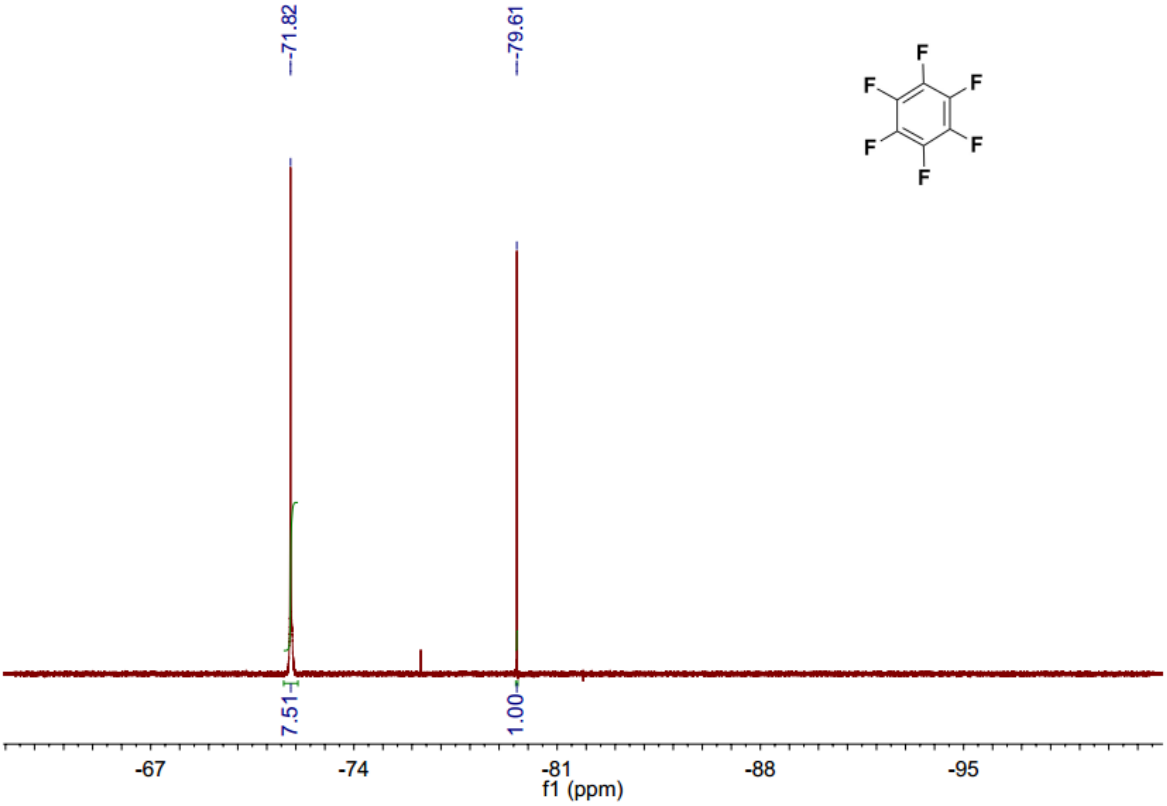

-71.81
-79.61
OH
6.79
1.00
-67
-74
-81
-88
-95
f1 (ppm)

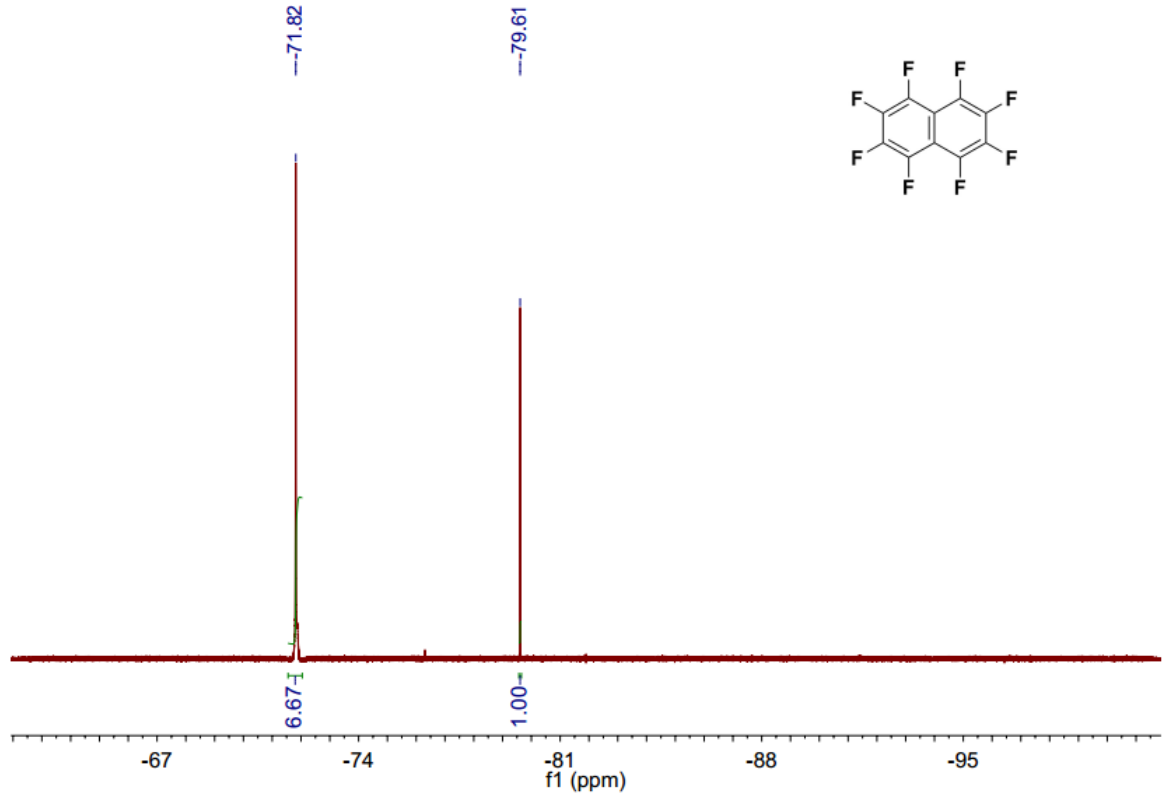

-71.81
-79.61
OH
9.31
1.00
-67
-74
-81
-88
-95
f1 (ppm)

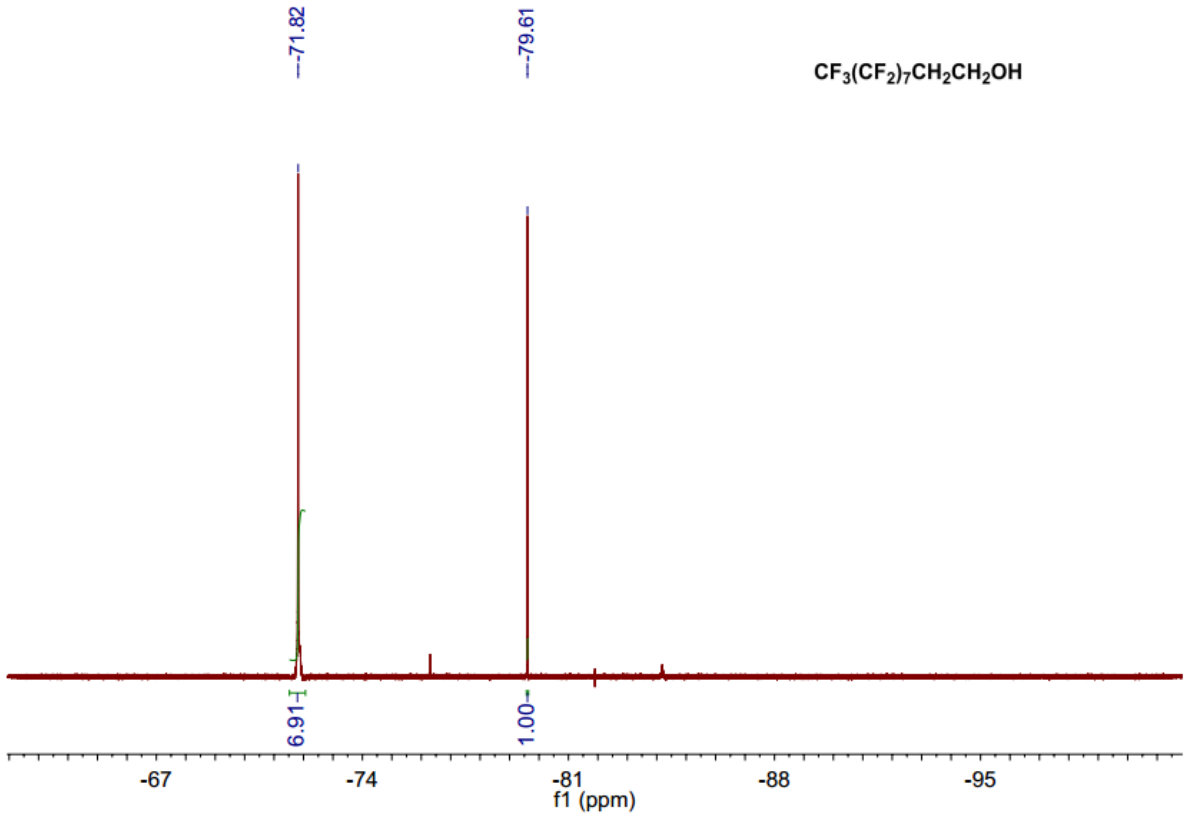

-71.82
-79.61
OH
7.43
1.00
-67
-74
-81
-88
-95
f1 (ppm)

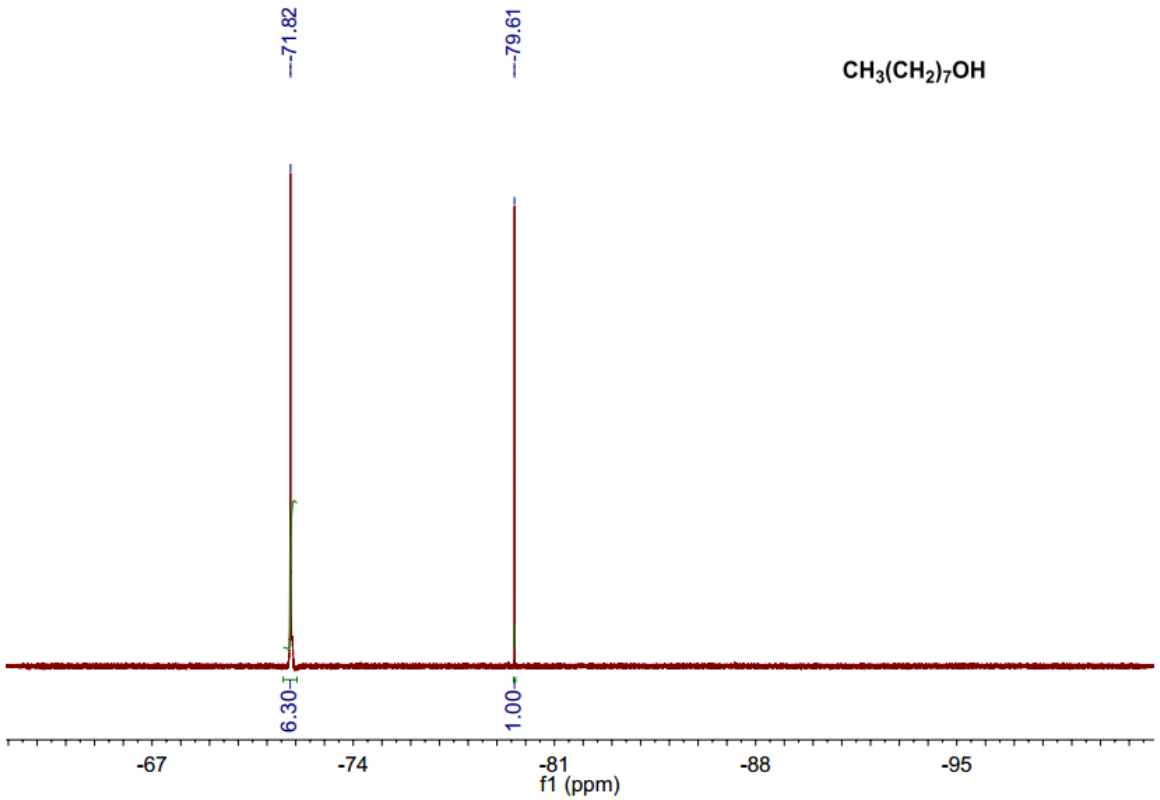

-71.82
-79.61
O
O
7.02
1.00
-67
-74
-81
-88
-95
f1 (ppm)

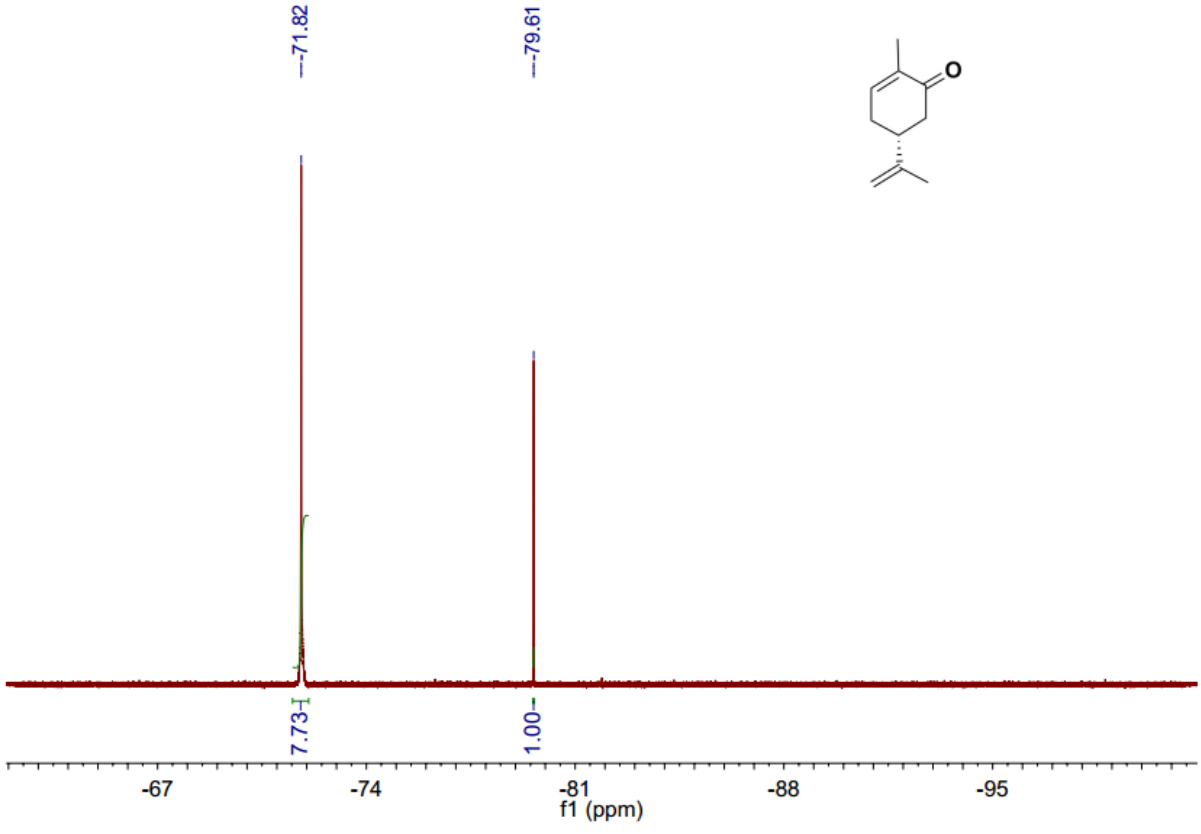

-71.81
-79.61
HO
OH
OH
6.63
1.00
-67
-74
-81
-88
-95
f1 (ppm)

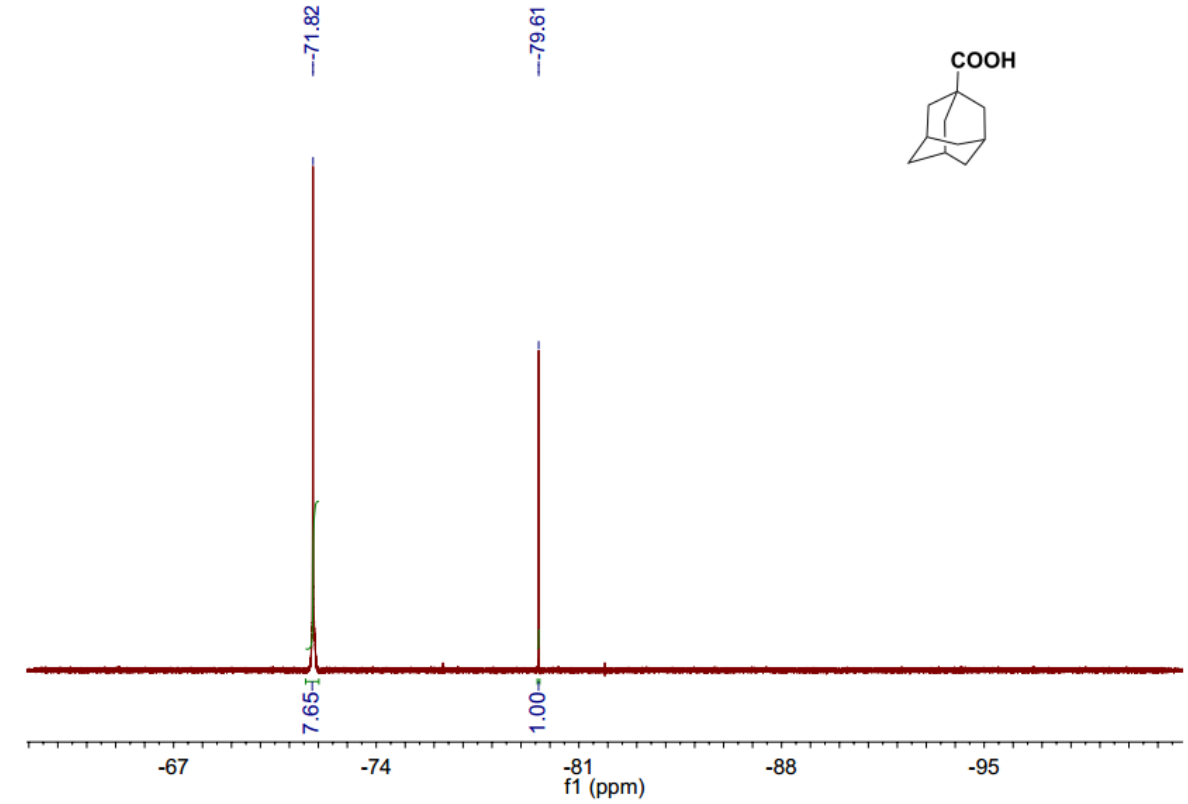

-71.82
-79.61
F
F
F
F
F
7.51
1.00
-67
-74
-81
-88
-95
f1 (ppm)

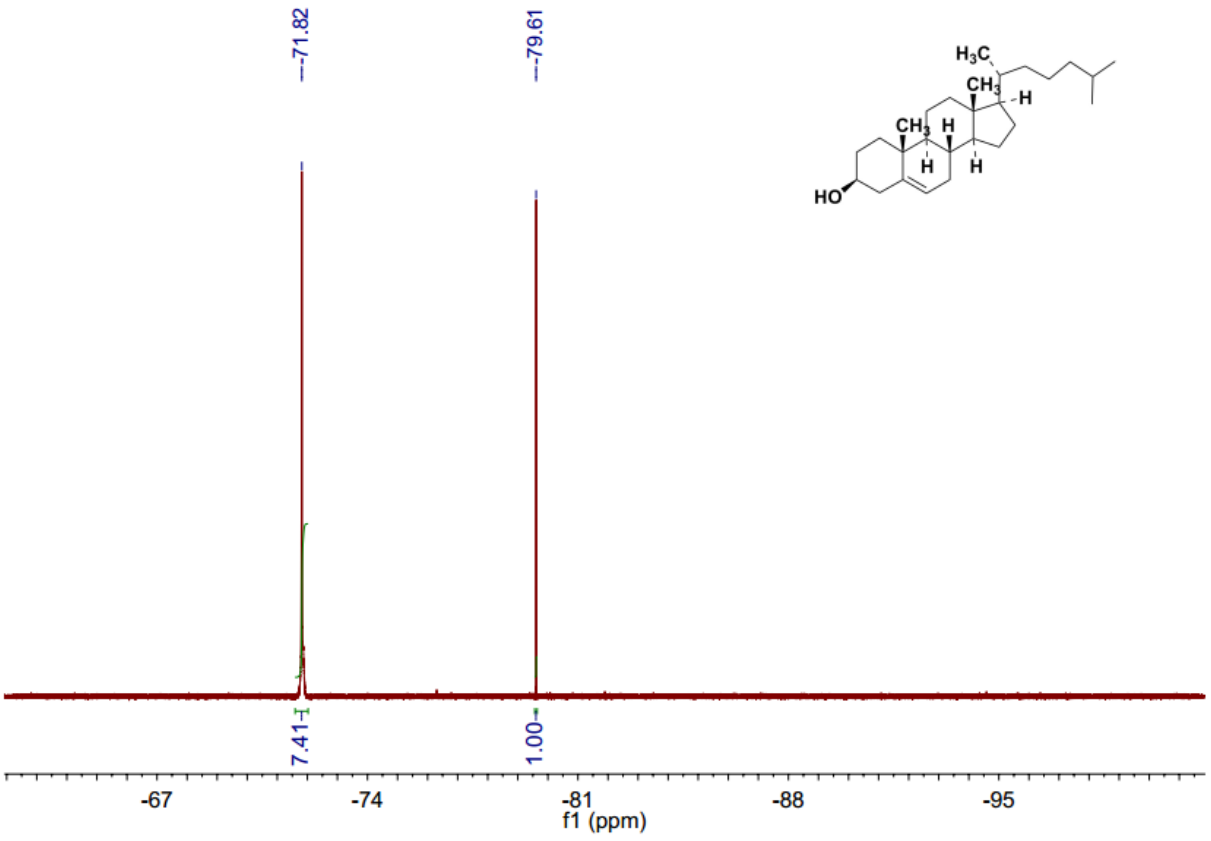

-71.82
-79.61
F
F
F
F
F
F
6.67
1.00
-67
-74
-81
-88
-95
f1 (ppm)

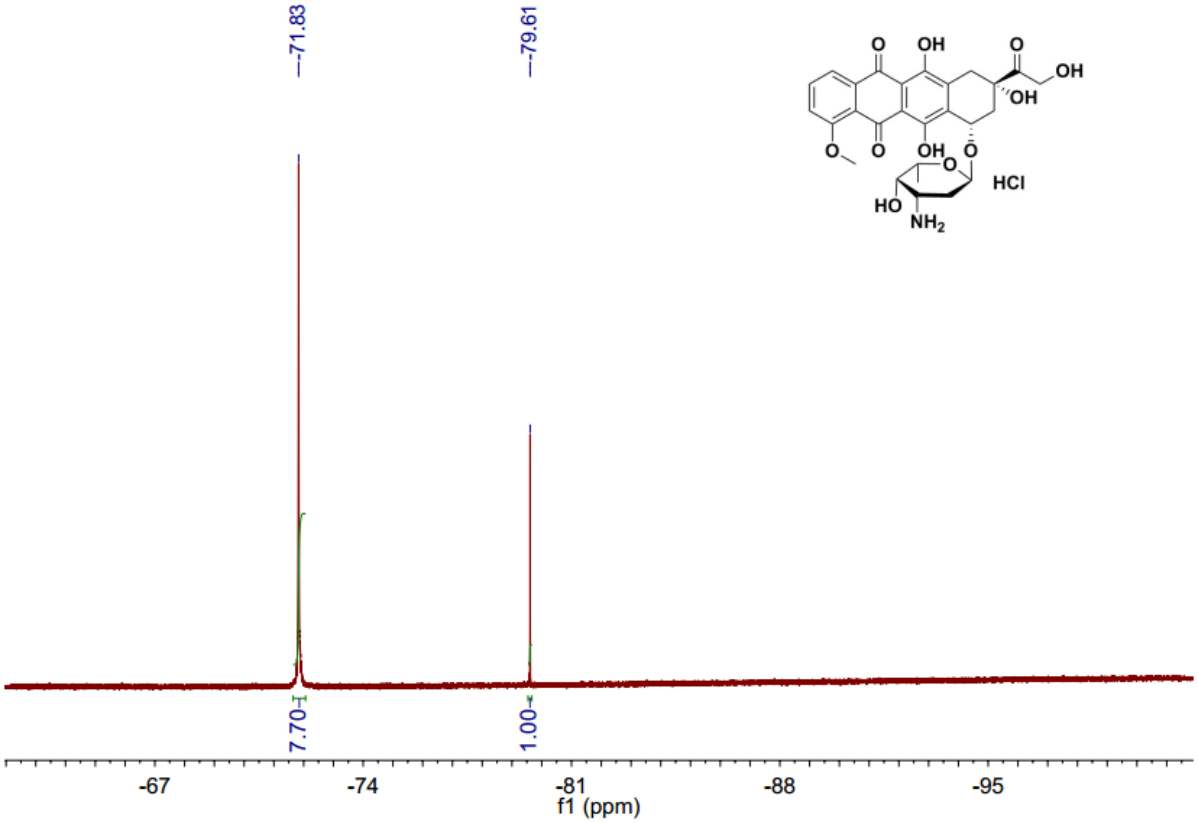

-71.82
-79.61
CF3(CF2)7CH2CH2OH
6.91
1.00
-67
-74
-81
-88
-95
f1 (ppm)

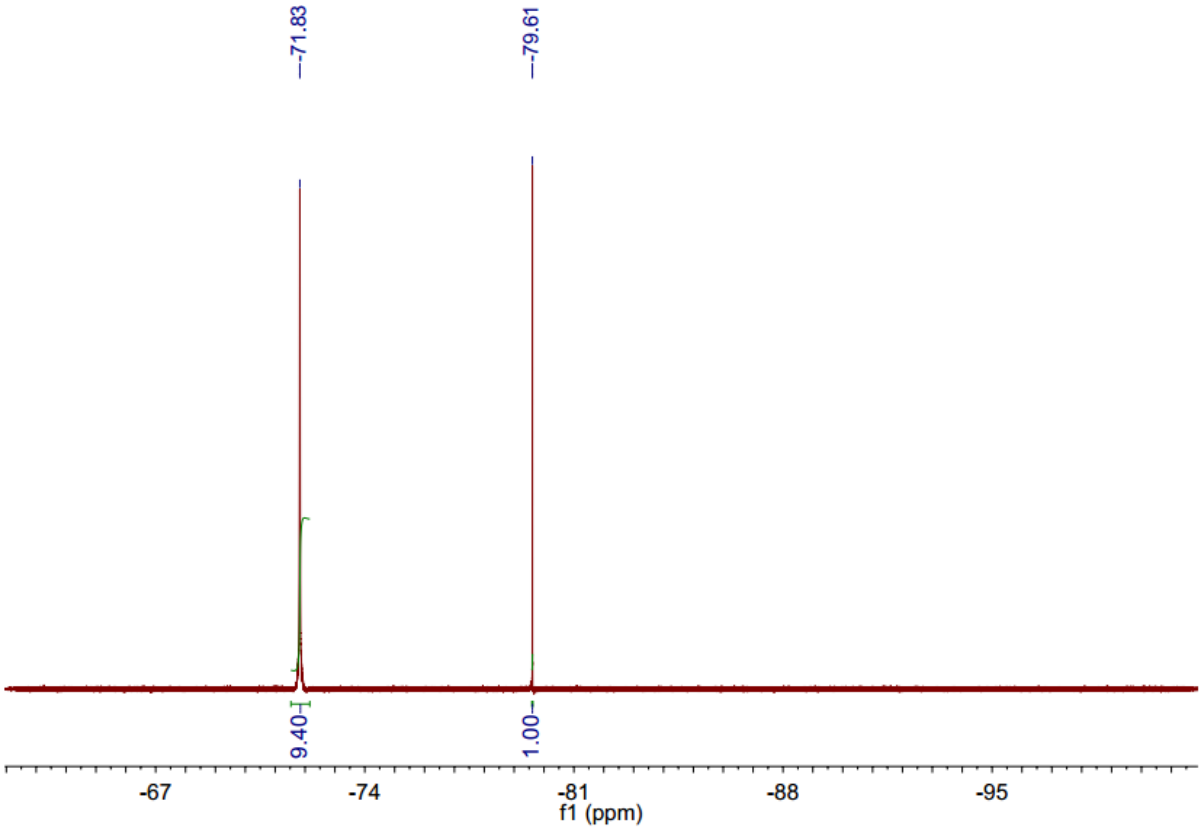

-71.82
-79.61
CH3(CH2)7OH
6.30
1.00
-67
-74
-81
-88
-95
f1 (ppm)


-71.82
-79.61
O
7.73
1.00
-67
-74
-81
-88
-95
f1 (ppm)


-71.82
-79.61
COOH
7.65
1.00
-67
-74
-81
-88
-95
f1 (ppm)

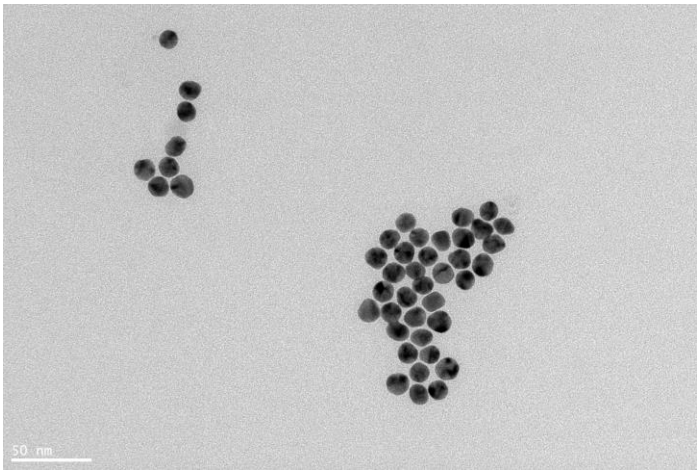

-71.82
-79.61
H3C
CH3
H
CH3
H
H
H
HO
7.41
1.00
-67
-74
-81
-88
-95
f1 (ppm)


-71.83
-79.61
O
OH
O
OH
OH
O
O
OH
O
HCl
HO
NH2
7.70
1.00
-67
-74
-81
-88
-95
f1 (ppm)

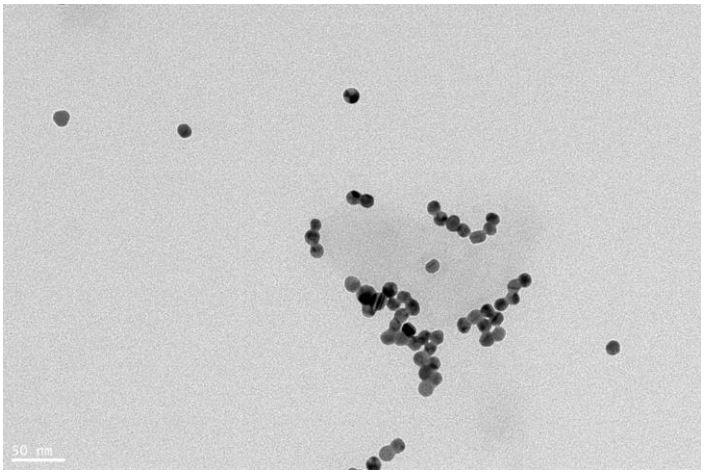

-71.83
-79.61
9.40
1.00
-67
-74
-81
-88
-95
f1 (ppm)

## 13. Copies of TEM, DLS and UV-Vis spectra of free GNPs, 1a and 2a modified GNPs

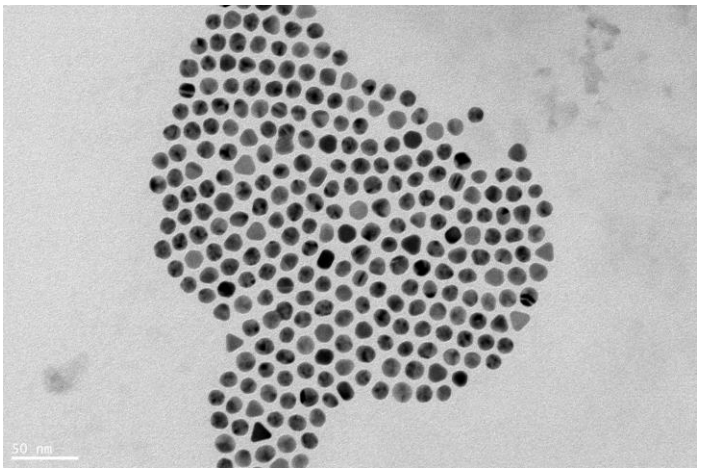
TEM (GNPs)



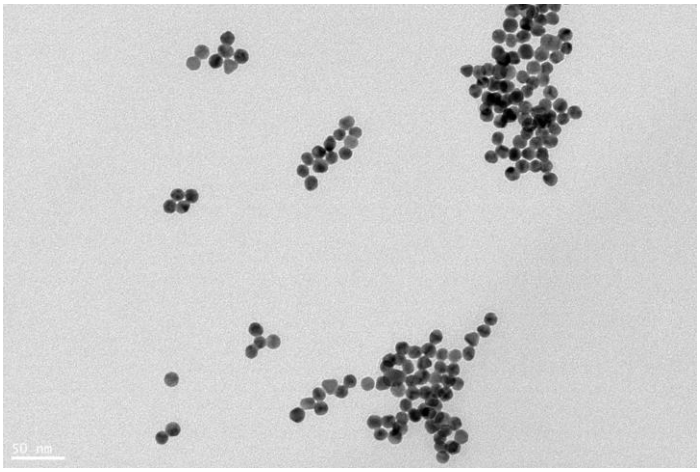

TEM (**1a** modified GNPs)



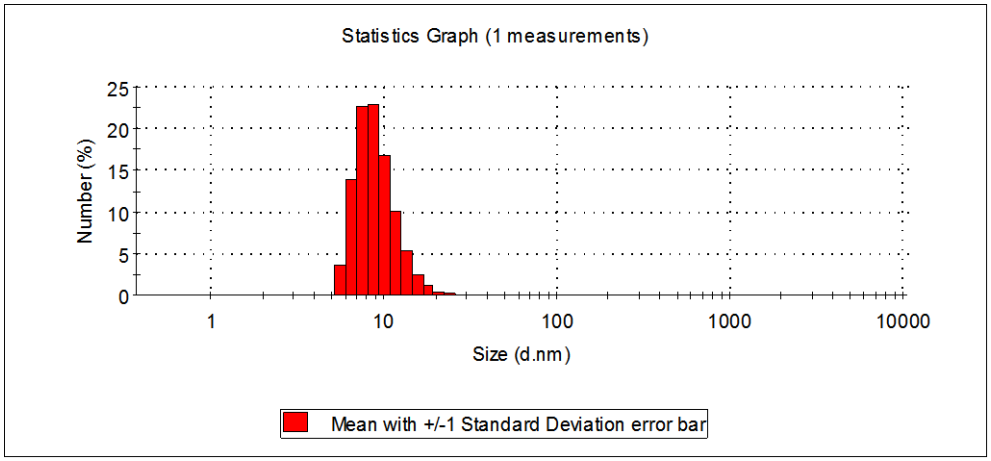

TEM (GNPs)



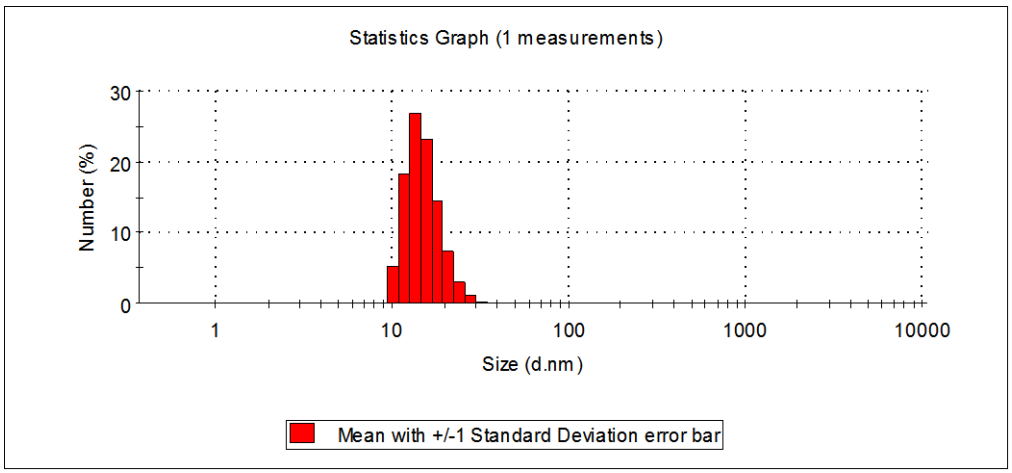
TEM (**2a** modified GNPs)



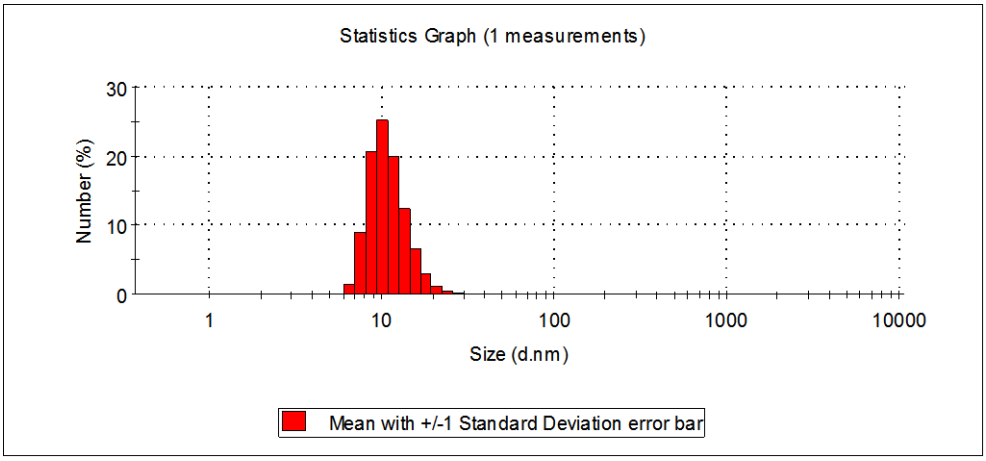
DLS (GNPs)



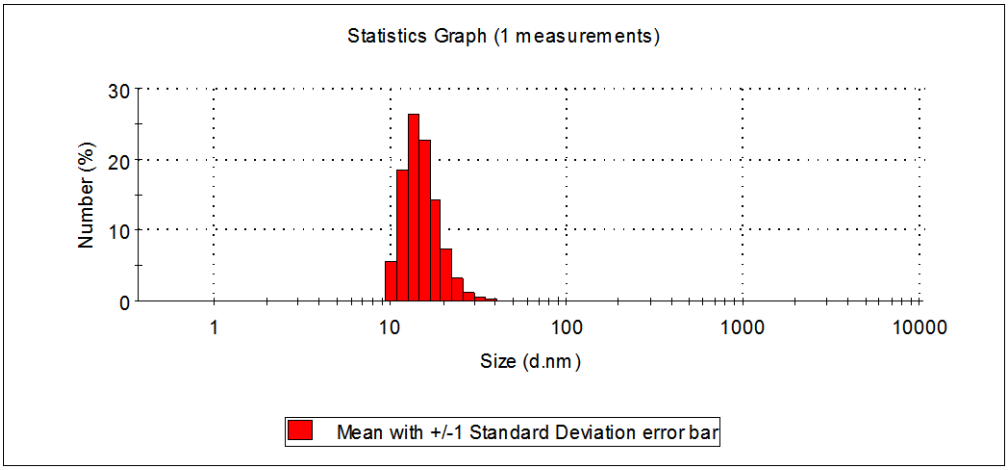

DLS (**1a** modified GNPs)



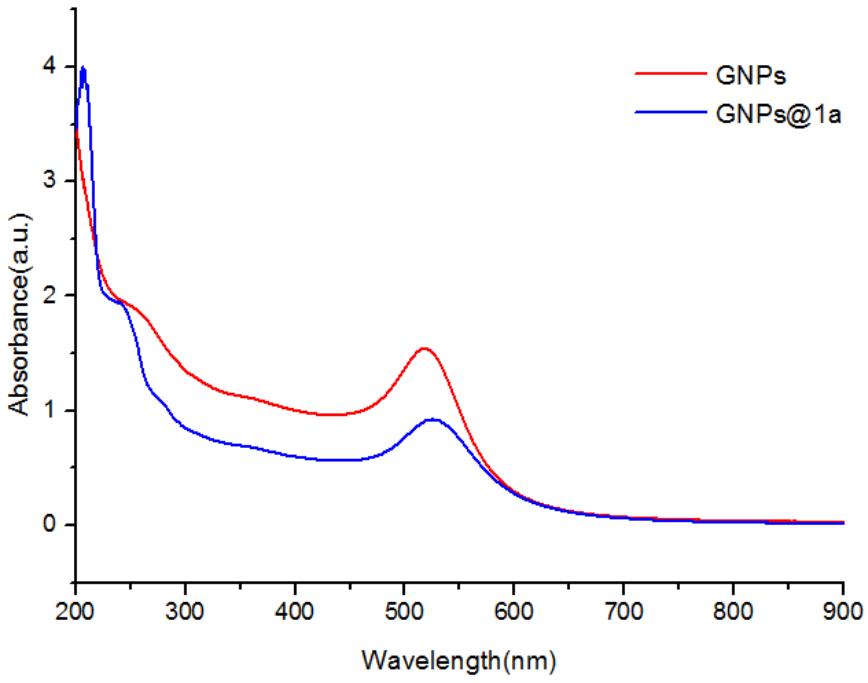

DLS (GNPs)



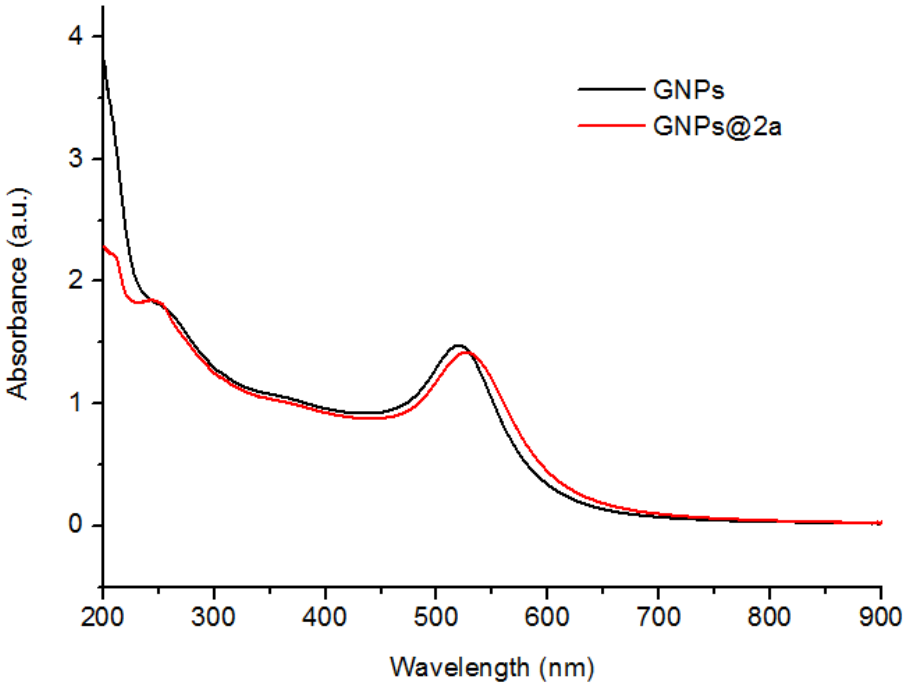

DLS (**2a** modified GNPs)




UV-Vis (GNPs and **1a** modified GNPs)



UV-Vis (GNPs and **2a** modified GNPs)




## 14. Copy of DLS spectra of compound 1b